# ELECTRICAL REVIEW

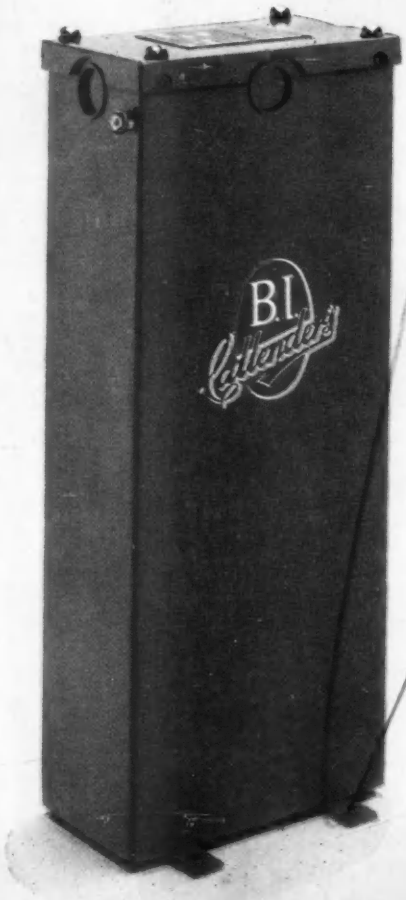
FRIDAY
OCTOBER 1958

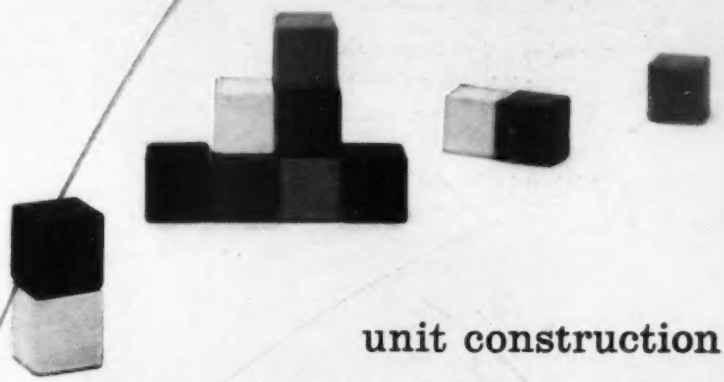
WEEKLY
PRICE 1s 6d



PUBLIC LIBRARY
OCT 27 1958
DETROIT





## unit construction

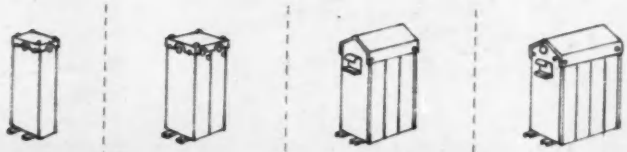
enables us to offer a wide range of capacitors for correcting the power factor of any load with efficiency and economy.

**BICC capacitors**

*for power factor correction*

*Call in the experts!*

Without charge or obligation, our specialist engineers are always ready to visit you and advise how capacitors can save you money. Publication No. 401 is also available on request.

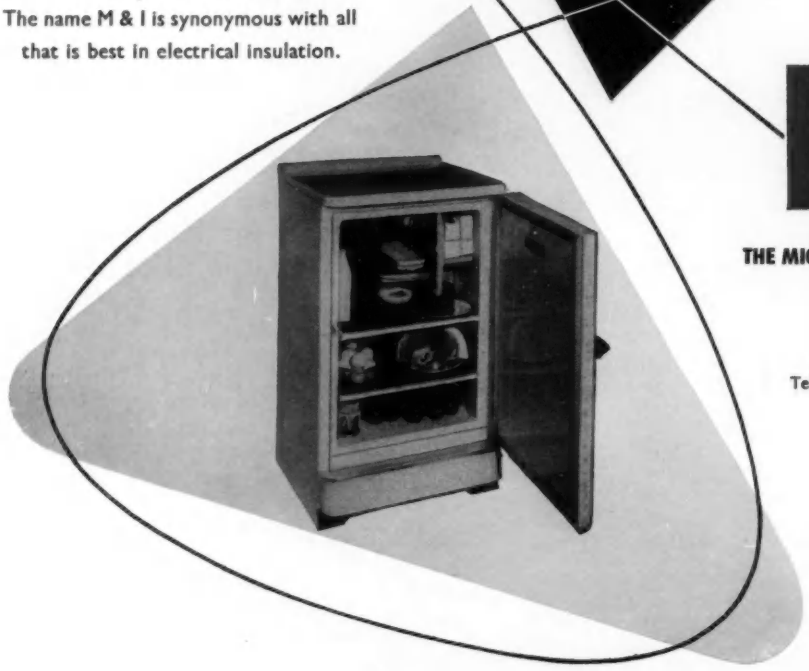


BRITISH INSULATED CALLENDER'S CABLES LIMITED · 21 BLOOMSBURY STREET, LONDON, W.C.1

*UPPER PHOTOGRAPH by courtesy of Birlec Ltd.*
*LOWER PHOTOGRAPH. Coldrator refrigerator by courtesy of The Hotpoint Electric Appliance Co. Ltd.*

## M & I PRODUCTS in hot spots and cold places

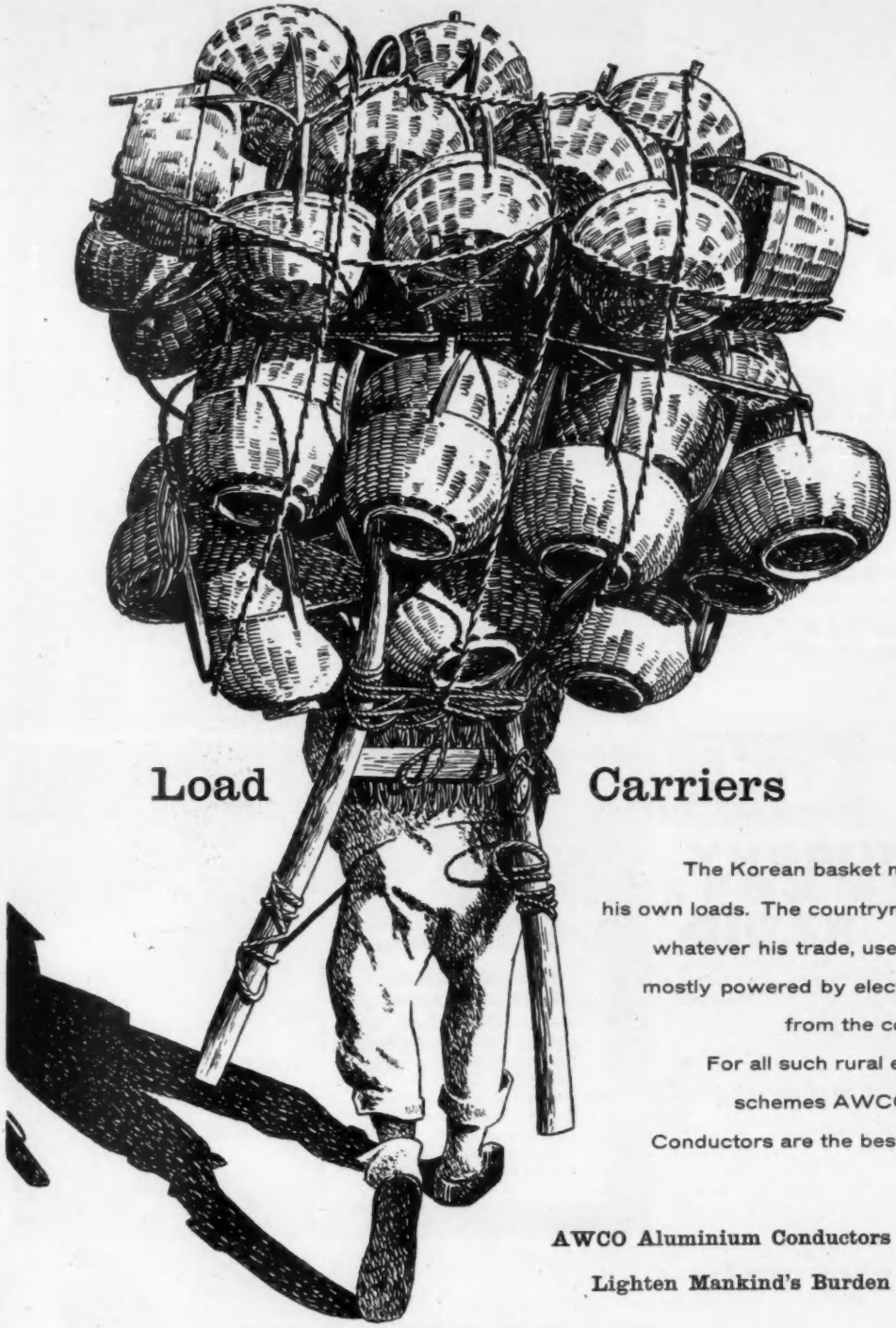
For safety and efficiency under all conditions it is essential to use only the finest materials. The name M & I is synonymous with all that is best in electrical insulation.



**m and i**

**THE MICANITE & INSULATORS CO., LTD.,**
Empire Works, Blackhorse Lane,
Walthamstow, London, E.17.
Telephone: Larkswood 5500.
Telegrams: Mytilite, Easphone, London.

MICA, MICANITE, "PAXOLIN", "PANILAX", EMPIRE VARNISHED INSULATION ON PAPER, CLOTH, SILK, NYLON, GLASS & TERYLENE BASE, SILICONE INSULATION, HIGH VOLTAGE BUSHINGS, FIBROUS MATERIALS, INJECTION MOULDINGS & EXTRUSIONS IN PVC AND OTHER THERMOPLASTICS



# Load Carriers

The Korean basket maker carries his own loads. The countryman of today, whatever his trade, uses machinery, mostly powered by electricity drawn from the country's grid. For all such rural electrification schemes AWCO Aluminium Conductors are the best investment.

**AWCO Aluminium Conductors**

**Lighten Mankind's Burden everywhere**

AWCO

**ALUMINIUM WIRE & CABLE COMPANY LIMITED**

Britain's Largest Manufacturers of Aluminium Wire & Conductors

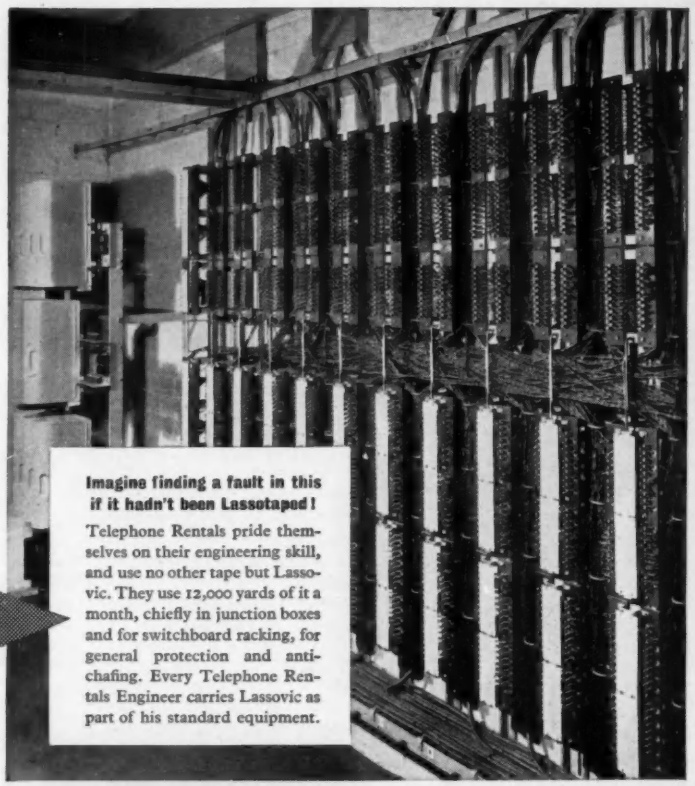
Head Office & Works: Port Tennant, Swansea, Glamorgan

Sales Office: 2 St. James's Square, London, S.W.1 Telephone: TRAfalgar 6441

*AP.61*

A

# This is why TELEPHONE RENTALS



**Imagine finding a fault in this if it hadn't been Lassotaped!**

Telephone Rentals pride themselves on their engineering skill, and use no other tape but Lassovic. They use 12,000 yards of it a month, chiefly in junction boxes and for switchboard racking, for general protection and anti-chafing. Every Telephone Rentals Engineer carries Lassovic as part of his standard equipment.

# and MURPHY RADIO

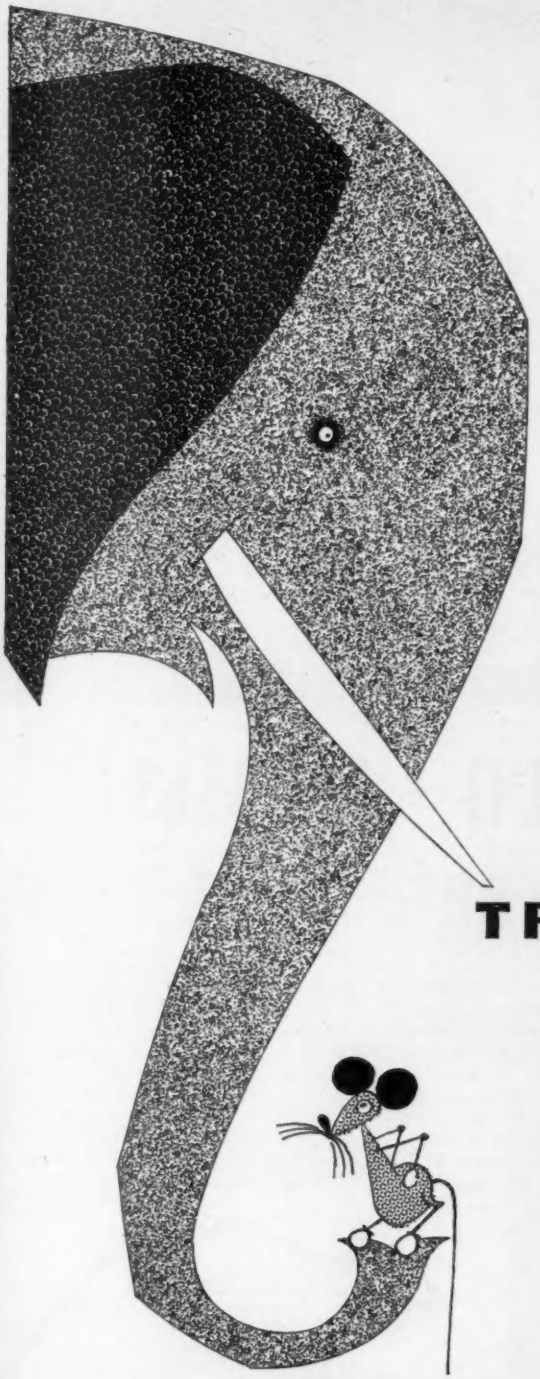
**Corrosion is the danger: Lassothene is the answer**

Any material that Murphy uses has to pass rigorous type approval tests in their Engineering Dept. They gave Lassothene good marks for high dielectric strength, low water absorption, and chemical purity. Here are components for a portable radio, and TV sets.

# always rely on LASSOTAPES

*Advice and information free at any time from*

TECHNICAL TAPES DIVISION, H24 SMITH & NEPHEW LTD., WELWYN GARDEN CITY.



# LARGE or small

**HV.** or **LV.**

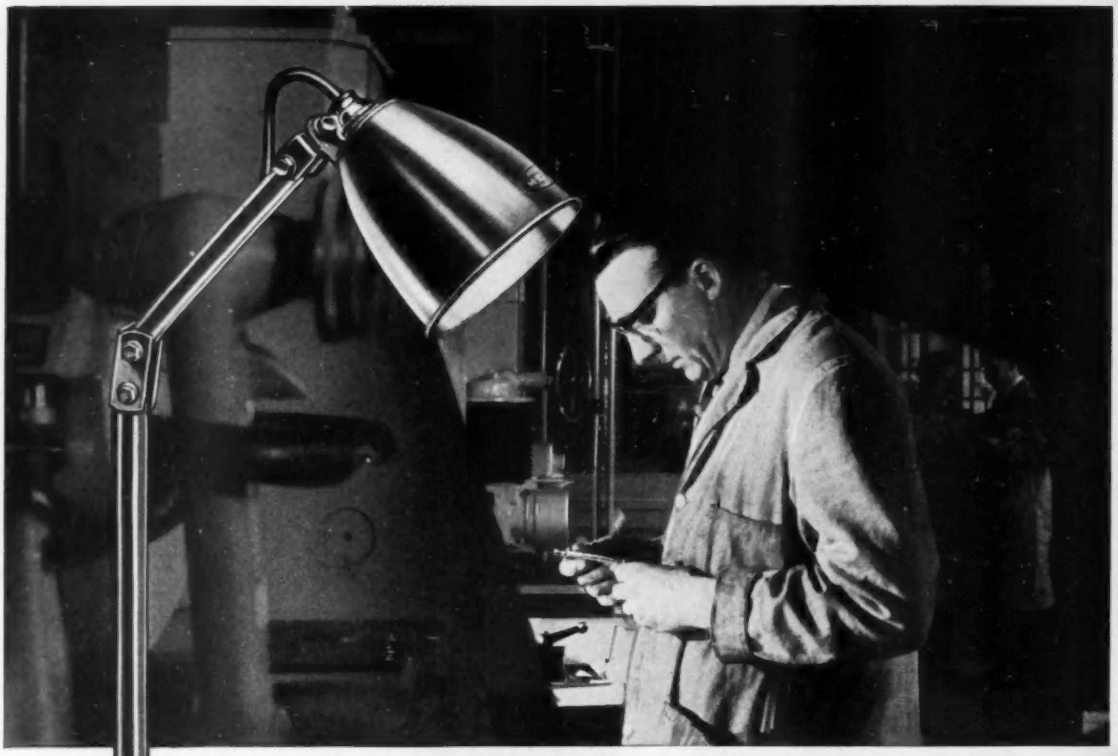
*it's agreed*

**DAVENSET**

**TRANSFORMERS**

*Of course!*

**PARTRIDGE WILSON & CO. LIMITED LEICESTER**



# MEMLO + MEMLITE a safe light

Manufacturers save on lighting costs and provide increased safety for operators by installing low voltage localized lighting. This lighting is made even more economical by using the "Memlo" low voltage transformer unit. Designed for mounting in convenient positions, where low voltage lighting is desirable, "Memlo" comprises a main D.P. switchfuse, a double wound transformer and fuses for secondary circuit, all enclosed in a neat cast-iron case. Three models are available for use on A.C. supply to step down voltage from 230/250 to 12 or 25 volts, 400/440 to 12 or 25 volts, and 400/440 volts to 25 or 50 volts. "Memlite" adjustable lamp fittings are all supplied with bases available for conduit attachment, "Memlo" attachment, or portable use. Write for full descriptive literature.

**Model 2 B.S. attached to "Memlo"**

The light industrial pattern "Memlite" illustrated is provided with two arms and a metal reflector, enamelled white inside and grey outside. The shade is supported independently of the lampholder. A standard B.C. all-insulated lampholder is supplied wired with twin flex.

**Two arm Heavy Industrial Pattern**

A lamp fitting of high quality and great strength for heavy service. Fittings are supplied complete with all-insulated B.C. lampholders, wired with twin flex. Joints, etc., have special rust-resisting finish.

**Three arm Heavy Industrial Pattern**

Made on similar lines to the two arm heavy industrial pattern, for those positions where greater extension is required.

MEM

MIDLAND ELECTRIC MANUFACTURING CO. LTD · TYSELEY · BIRMINGHAM 11

# A.C. DIRECT-ON-LINE
# CONTACTOR STARTER
# WITH ISOLATING SWITCH

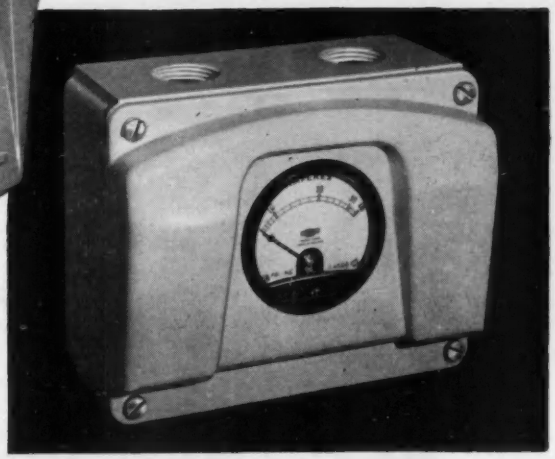
Up to 5 h.p. 200-550 volts 25-60 cycles

For three-phase or single-phase non-reversing squirrel-cage induction motors.

These well-established contactor switch-starters are now available fitted with mechanically interlocked three- or five-pole isolating switch. An ammeter unit and/or HRC fuse unit can also be accommodated in addition to, or in place of, the isolating switch unit.

The isolating switch can be supplied as a 3-pole 'on-load' switch rated at 30 amperes maximum (tested to break 100 amp. at 440 v.), or alternatively in 5-pole form with three main 30-amp. poles plus two normally open control-circuit auxiliary poles.

The starters comply in every respect with BS587, 1957 for 'Frequent Duty', i.e. forty starts per hour.



**Type DOC 71**

## BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

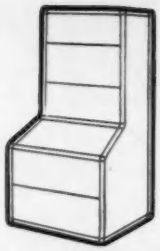
*an A.E.I. Company*

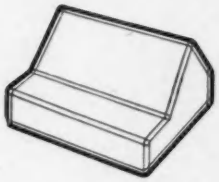
A5269

## make them in no time with

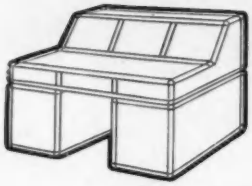
# imlok

## and cut out tool costs!





This unique, low-cost construction system comprises aluminium alloy extrusions and locking corner connectors. It's simplicity itself: precision cases, cabinets and other structures can all be quickly built to your own design without incurring tool costs. Smart . . . speedy . . . strong . . . you'll find Imlok a boon for research and prototype work and so often the answer to a production problem too. Write now for full information.



**Here's the secret of IMLOK'S strength**

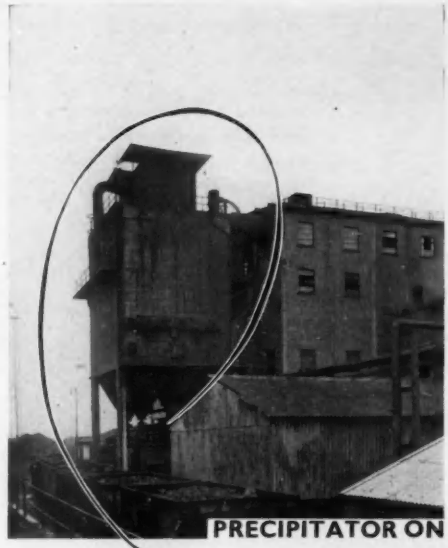
*The extrusions slide over the long arms of the connector - overlapping and gripping it to give positive lock*

**IMLOK** ***cheapest in the short run . . . cheaper in the long run***

**ALFRED IMHOF LIMITED Dept. D10, Ashley Works Cowley Mill Road Uxbridge Middlesex Telephone: UX5-5567**

*Export and London Showrooms:* 112-116 *New Oxford St WC1: MUSeum* 7878

## *Clean Air with Sturtevant Plant*



*This*

# STURTEVANT
## ELECTROSTATIC PRECIPITATOR

. . . . . prevents large quantities of coal dust from polluting the atmosphere and covering a wide area of the surrounding countryside.

The photographs demonstrate how completely the large volumes of dust from the coal dryer are collected by a Sturtevant Precipitator.

Sturtevant Precipitators are collecting —

| | | |
|---|---|---|
| **Metallic Oxides** | **Asbestos** | **Coal Dust** |
| **Carbon and Carbon Black** | **Sugar** | **Ceramic Dust** |
| **Selenium Fumes** | **Acid Mist** | **Limestone** |
| **Boiler Flue Dust** | **Pyrites** | **Phosphate Dust** |
| **Precious Metals** | **Chalk** | **Cement Dust** |

*For particulars of Sturtevant Electrostatic Precipitators write for a copy of the 11th edition of our publication U/7009.*

**STURTEVANT ENGINEERING CO. LTD.**
**Southern House, Cannon Street, LONDON, E. C. 4.**

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD. 400 SUSSEX STREET SYDNEY N.S.W.

# R·E·A·L 'CLIPTITE' CEILING FITTINGS WITH "PERSPEX" DOME

Full details of the unique patented fixing method incorporated in "Cliptite" Ceiling Fittings is shown in Catalogue P.5806. Have you received your copy?

## Compact and completely dustproof !

**The R.E.A.L. "Cliptite" Fitting No. 1222—styled on modern lines and of completely dustproof construction—is ideal for the general overhead illumination of small and medium-size living rooms, entrance halls, corridors, etc,. or for any indoor situation where a well-diffused restful light from above is desired. It is, at present, made in two sizes —60 watt and 100 watt—and specifically for ceiling mounting.**

## Completely dustproof?

*YES!*
*The "Perspex" dome engages firmly against a felt gasket in the ceiling plate.*
*Fitted or removed in literally a second, the dome is securely sealed in position by stainless steel bayonet catch fitments. Double springing obviates any trace of backlash.*

## YES! definitely dustproof!

**R E A L**

**R.E.A.L.** *is the registered trade mark of*
ROWLANDS ELECTRICAL ACCESSORIES LTD.,
R.E.A.L. WORKS, BIRMINGHAM, 18

## block schematic

The copper rod, made from high purity electrolytically refined copper, is fed through progressively finer Tungsten Carbide dies and round the block on to the take-up reel. Wherever there is a need to manufacture electrical instruments or apparatus, to combine into strands, to form the overhead lines across the countryside, to provide the vital link in a cable — there is always a need for copper wire in varying diameter and strength.

# ANACOS (Regd.)

## copper wire

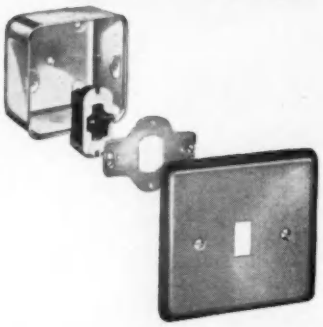
*In all sizes from 0.001" diameter upwards, plain annealed, hard drawn or tinned annealed, on reels, drums or in coils, for use in instruments, cables, radio parts, and also for telephone, telegraph and power transmission lines.*

**FREDERICK SMITH & COMPANY**

ANACONDA WORKS · SALFORD 3 · LANCS

# Standardise with

## .....the most VERSATILE Switch of all



The Gridswitch is the answer to uniformity of appearance throughout the largest scheme. Standard components result in quicker installation and lower costs. Every switch matches: every part is interchangeable. Extensions and alterations are easier: maintenance is simple beyond words. The MK Gridswitch has made all this a reality in very many of the latest buildings. Please ask for a fully descriptive leaflet

MK

M. K. ELECTRIC LIMITED

WAKEFIELD ST. LONDON N.18

TELEPHONE: EDMONTON 5151

### THE SWITCHES

**4771**
*5 amp. One way S.P. switch Brown or Ivory*

**4772**
*5 amp. Two way S.P. switch Brown or Ivory*

**4773**
*5 amp. Intermediate switch Brown or Ivory*

**4775**
*5 amp. Bell-push Brown or Ivory*

**4777**
*5 amp. One way secret key switch Brown or Ivory*

**4778**
*5 amp. Two way secret key switch Brown or Ivory*

**4761**
*15 amp. One way S.P. switch Brown or Ivory*

**4762**
*15 amp. Two way S.P. switch Brown or Ivory*

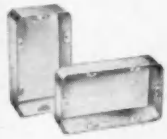
**4776**
*15 amp. One way D.P. switch Brown or Ivory*

**4779**
*Neon indicator unit Red*

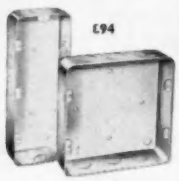
**4770**
*Blank inset Brown or Ivory*

### SURFACE OR FLUSH BOXES

**891**



**892**



**893**

**895**

### GRIDS

**3701**

**3702**

**3703**

**3704**

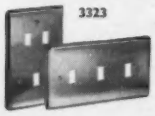
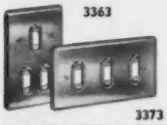
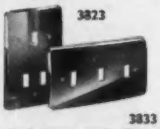
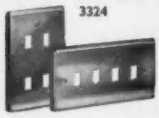
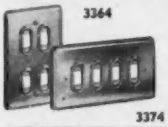
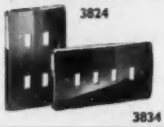
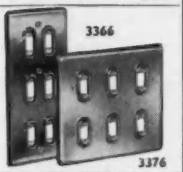
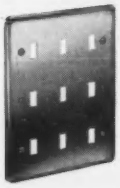
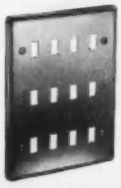
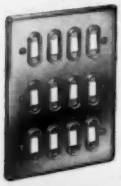
**Two 3703**

**Two 3704**

**Three 3703**

**Three 3704**

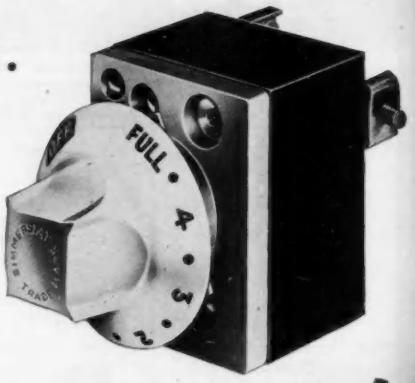
# The GRIDSWITCH

| FLUSH PLATES | | | SURFACE PLATES | |
|---|---|---|---|---|
| Brass plates Finish—BMA or Matt Chrome | Protected Brass plates Finish-BMA or Matt Chrome | Insulated plates Finish—Brown or Ivory | Brass plates Finish—BMA or Matt Chrome | Steel plates Finish—Aluminium Stove Enamel |
| 3331 | 3371 | 3831 | 3341 | 3381 |
| 3332 | 3372 | 3832 | 3342 | 3382 |
| 3323  3333 | 3363  3373 | 3823  3833 | 3343 | 3383 |
| 3324  3334 | 3364  3374 | 3824  3834 | 3344 | 3384 |
| 3326 3336 | 3366  3376 | *6-gang available December, 1958* | 3346 | 3386 |
| 3338 | 3378 | *8-gang available December, 1958* | 3348 | 3388 |
|  3339 | 3379 | * | 3349 | 3389 |
|  3340 |  3380 | * | 3352 | 3392 |

MK158DHB

# Even more compact . . .

# even more efficient . . .




## the NEW

# 'Simmerstat'

## Regulator TYPE TYX/B

This new 'Simmerstat' is even smaller. It fits comfortably into any cooker switch chamber and can easily replace multi-heat switches since it uses the same fixing holes.

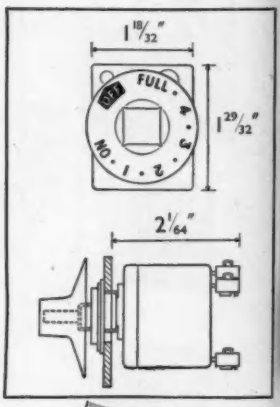
Housewives appreciate the 'Simmerstat' with its smooth finger-tip control of hotplates from slow simmer to fast boil—and the fact that it reduces electricity consumption by as much as 50%.

'Simmerstats' for grill and grill-boiler control are increasingly popular.

Two new features of TYX/B: control knobs rotate either way and there are definite dwells at "OFF" and "FULL".

There are nearly 5,000,000 'Simmerstats' in use, on cookers, wash-boilers, industrial ovens and any application requiring accurate variable heat control.

*Full specification in Technical Publication 3041 from:*
Sunvic Controls Limited, P.O. Box 1, Harlow, Essex.
Tel: Harlow 25271.




* *For the Few* housewives who still do not know about the 'Simmerstat', there is an attractive consumer leaflet. Supplies on request.

SUNVIC
An A.E.I. Company

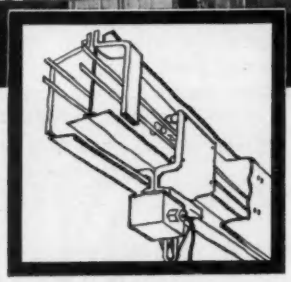
**'Simmerstat', water heater, air and oven thermostats**

SC/73

# FULLER ELECTRIC POWER TRACK . . .

## gives complete protection against trolley wire accidents

Bare trolley wires are a source of danger. Fuller Electric Power Track eliminates the danger, keeping the wires permanently, effectively covered so that they cannot be accidentally touched. Unlimited lengths of track can be erected, from straight and curved sections. Any number of trolleys can be used on one track. All types of electric supply are catered for. We shall be glad to tell you more about this important advance in factory safety.



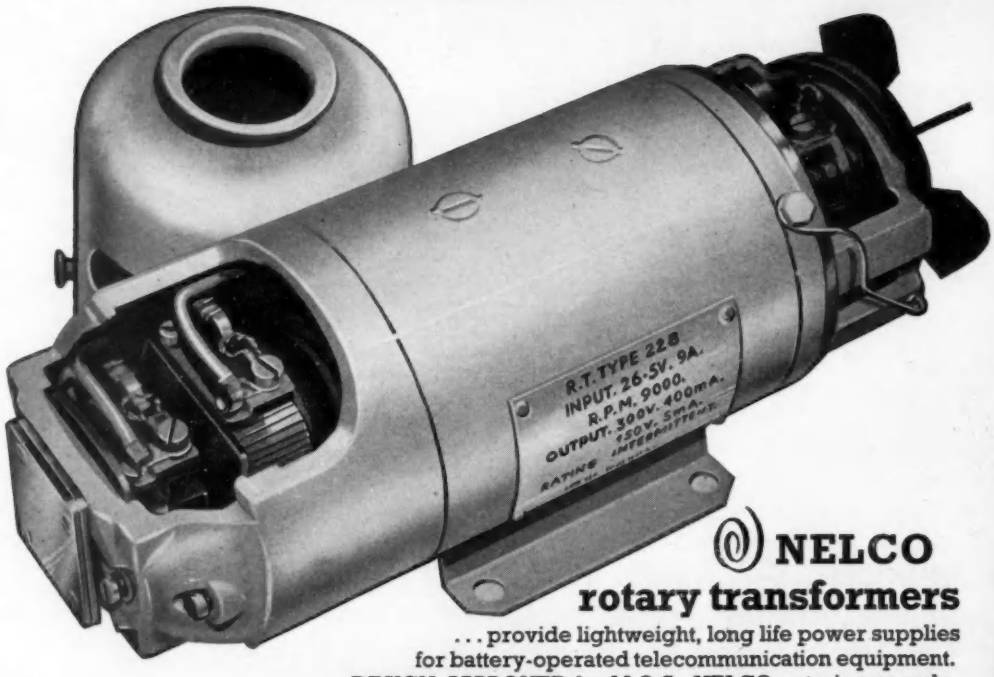
**consult** FULLER ELECTRIC

DIAMOND 1898-1958 JUBILEE

FULLER ELECTRIC LTD · FULBOURNE RD · LONDON E17

*Telephone LARkswood 2350*
*Also at Birmingham, Glasgow and Manchester*
**A member of the Hawker Siddeley Group.**

# Rotary Transformers




**NELCO rotary transformers**

. . . provide lightweight, long life power supplies for battery-operated telecommunication equipment. DESIGN APPROVED by M.O.S., NELCO rotaries comply with the stringent requirements of specifications E.L. 1082, R.C.S.11 and K.114. All NELCO Rotaries are wound with Class "B" insulation as standard and exceptional care is taken over performance and finish. NELCO moulded commutators using mica or micanite separators are used throughout and single, double or triple outputs can be provided. The standard range covers from 15 to 400 watts output but enquiries for rotaries outside this will receive careful attention.

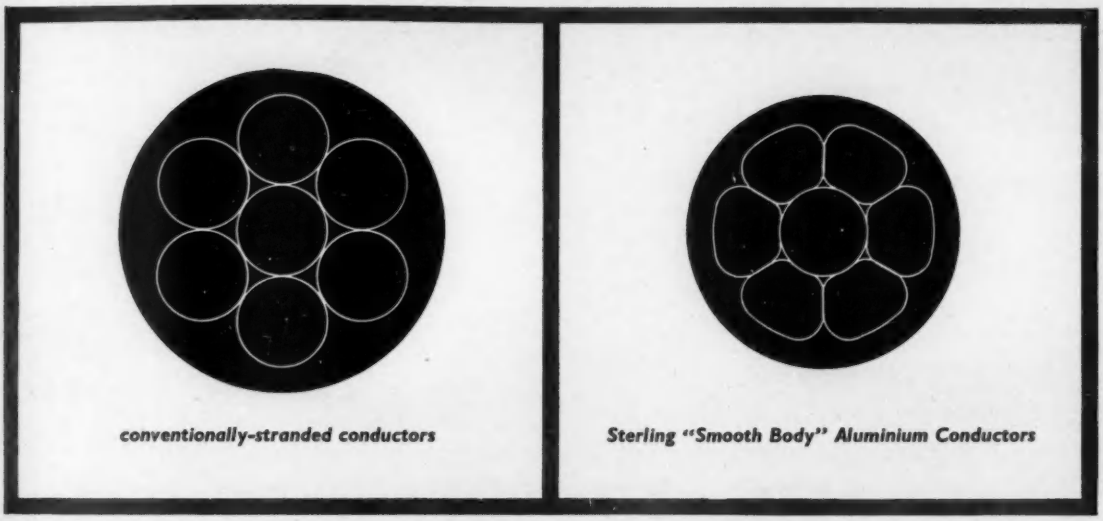
# NELCO LIMITED

*A.I.D. and A.R.B. Approved*

**STATION ROAD, SHALFORD, SURREY. Phone: GUILDFORD 5336/7/8**

N.15

# STERLING insulated 'SMOOTH BODY' aluminium conductors



*conventionally-stranded conductors*

*Sterling "Smooth Body" Aluminium Conductors*

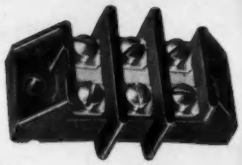
## show substantial reductions in

**SIZE.....8-9%**
**WEIGHT..10-12%**
**AND OF COURSE, PRICE**

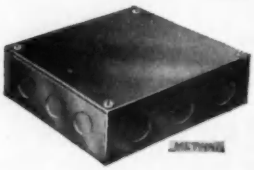
STERLING

**STERLING CABLE COMPANY LIMITED · ALDERMASTON · BERKSHIRE**
Telephone: Reading 1000 'Grams: Sterling Phone Reading Telex: 84137 Stericable Ald.

MAKING CONNECTIONS THE METWAY—

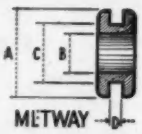


FLEXIBLE — NYLON, P.V.C., RUBBER — RIGID, BAKELITE, PORCELAIN 1-12 WAY 5-75 AMPS



ADAPTABLE BOXES
67 STANDARD SIZES

Ask for List No. NBQ10

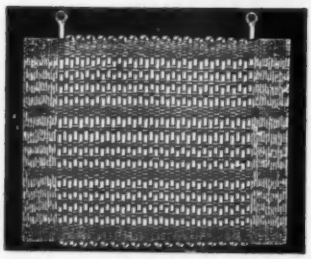



PACKING GLANDS
NYLON — BRASS

RUBBER GROMMETS

METWAY · BRIGHTON 7

Consult Birch
REGISTERED TRADE MARK
for
TOROIDAL RESISTORS
ASBESTOS WOVEN MATS



Asbestos woven Regulator, loading or heating grids, manufactured in a wide range of sizes to suit customers' particular requirements. End or intermediate tappings either lugs or flexible leads.
**Write for List No. 140.**

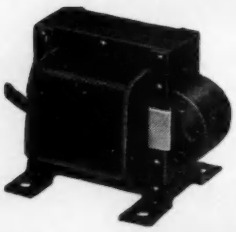
VITREOUS ENAMELLED RESISTORS
Ferrule or wire end type: full range of 24 sizes — 1½ — 250 watts. (List VE 190.)

*and for:*
Asbestos Woven Mats
Heating Elements
Loading Resistors
Motor Operated Resistors
Stud Type Resistors
Sliding Resistors

Birch
REGISTERED TRADE MARK

**H. A. BIRCH & CO. LTD.**
WOOD STREET, WILLENHALL, STAFFORDSHIRE
Telephone WILLENHALL 494 · 495 · Grams WILOHM WILLENHALL
LONDON OFFICE: 1-5 NORTHOLT ROAD, HARROW, MIDDLESEX
Tel.: BYRON 5120

A. C. SOLENOID TYPE SAM



Increased Performance
Continuous 14 ozs. at ¾"
Instantaneous to 5½ lbs.
Same dimensions as Type SA
Larger and Smaller Sizes Available. Greatly increased discounts for quantities. Also Transformers to 7 kVA 3-phase

**R. A. WEBBER LTD.**
18 FOREST ROAD, KINGSWOOD, BRISTOL Phone 67-4065

HILDICK & HILDICK
WALSALL TUBE WORKS
PLECK ROAD, WALSALL Phone WAL. 2123

In the interests of more efficient cable jointing
Sheen-Gas
portable furnaces manufactured by
HUGH PRICHARD & CO. (Nottm.) LTD
Greasley St. Bulwell
Nottm. Tel: 27-1437

"Design Registration No. 888934"

# "Wylex—
## Whatever Fusing you want!"

"Yes, I can make up any combination of fuses here because I stock bases and fuse assemblies separately. As the bases are common for any size fuse, I can make up any combination. What fusing do you want?—I can make it up for you now."

# Wylex

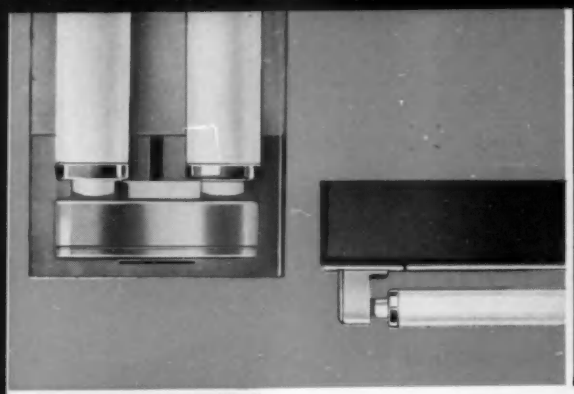
**SWITCH FUSE CONTROL UNITS**

ALL-INSULATED: 1, 2, 3, 4, 6, 8 WAY
METALCLAD: 3, 4, 6, 8 WAY

REWIRABLE 5, 15, 20 and 30 amp.
H.R.C. Cartridge 5, 15 and 30 amp.

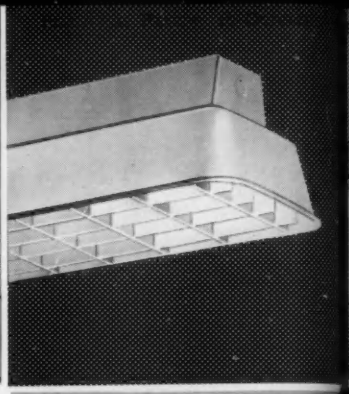
GEORGE H. SCHOLES & CO. LTD., WYLEX WORKS, WYTHENSHAWE, MANCHESTER 22

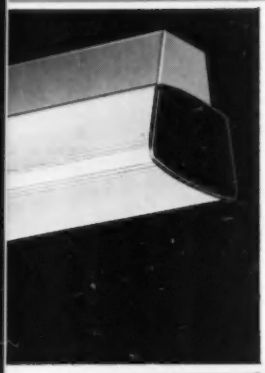
A*



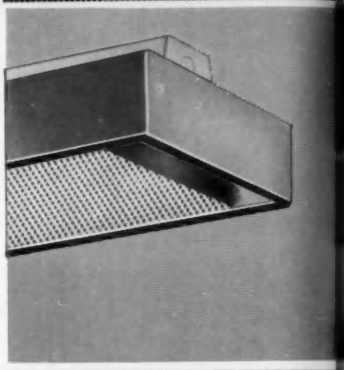
range

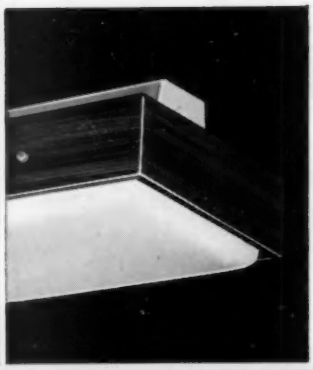
101

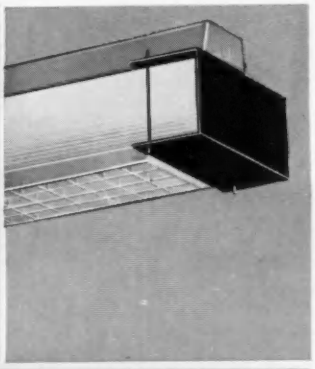


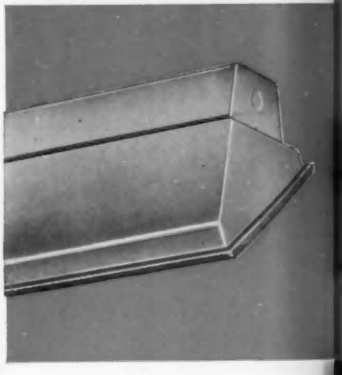


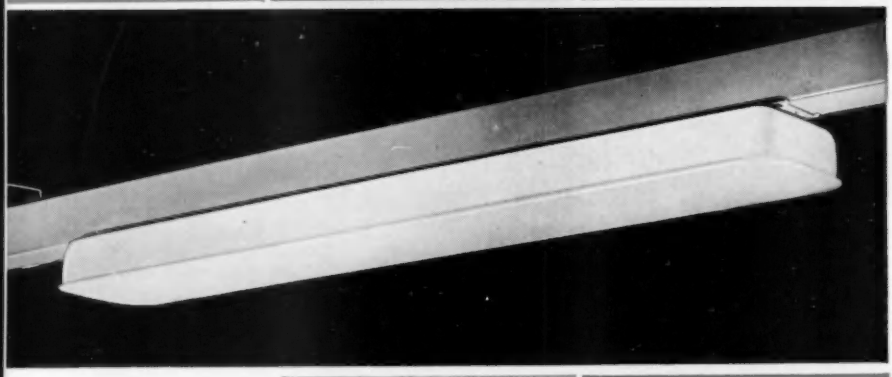
# G.E.C.





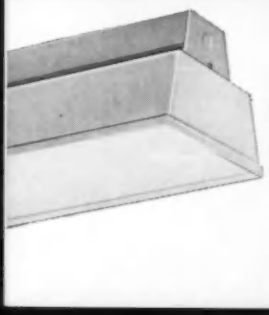


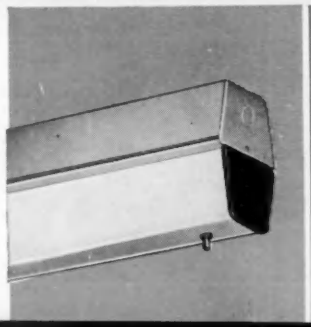




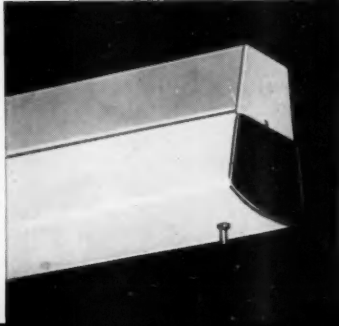
range

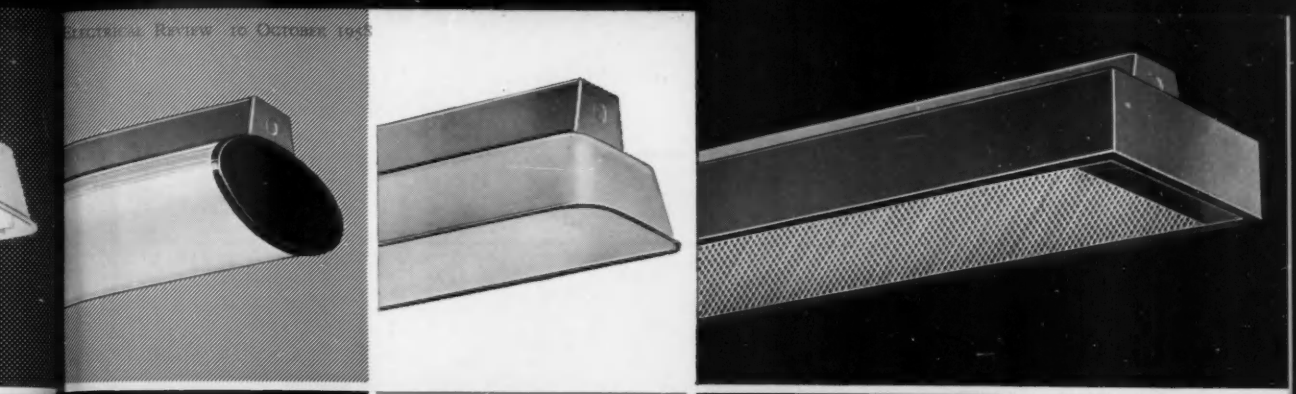
101

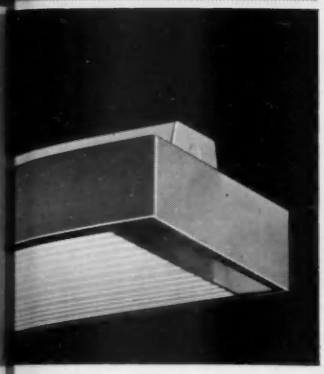




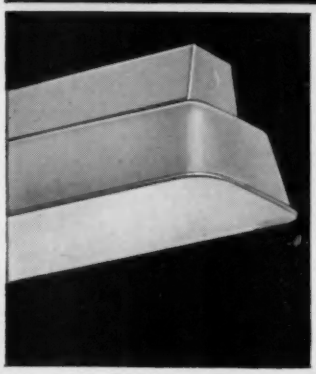
Always
specify
Osram
Guaranteed
Tubes



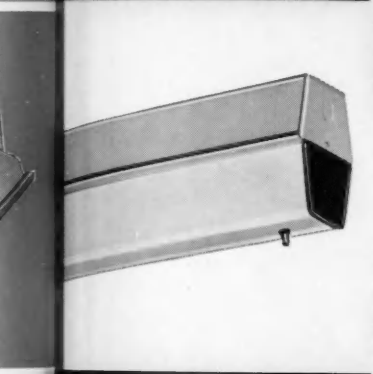


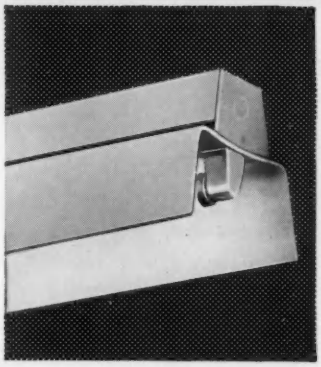


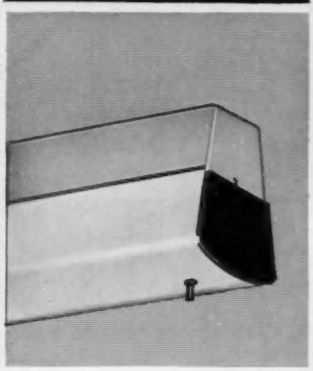
G.E.C.

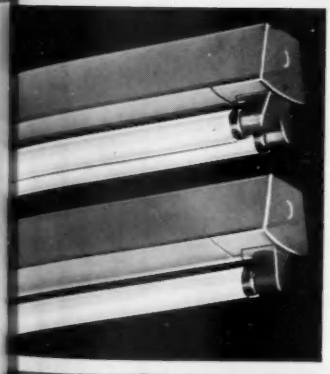


101 range

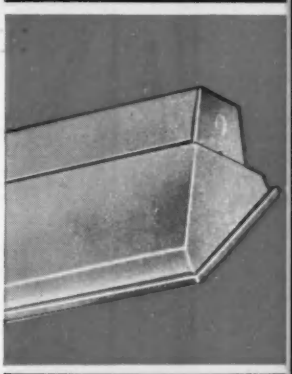








101 range



Send for Catalogue F4068

THE GENERAL ELECTRIC CO. LTD.
MAGNET HOUSE
KINGSWAY, LONDON, W.C.2

RIST'S
TERMINATE YOUR WIRING PROBLEMS—
If your requirements are for terminals, you can have them, and if you need terminated cords, leads or cable assemblies, we can make them.
RIST'S WIRES & CABLES LTD.
LOWER MILEHOUSE LANE · NEWCASTLE · STAFFS

# CHOOSE A FLEXELLO CASTOR

**Flexello**

*CONSTANT QUALITY*

**CASTORS**

Choose your castors from the largest range in Europe. Flexello will meet your special requirements individually, while our fabricating division designs and manufactures "special" castors for extra heavy and difficult applications.

*illustrated are a small part of our vast range.*

*Write for illustrated leaflet to Dept. ER.*

**FLEXELLO CASTORS & WHEELS LTD., SLOUGH, BUCKS. Tel: SLOUGH 24121**

---

**WEATHERPROOF METAL-CLAD SOCKETS, PLUGS, SWITCH SOCKETS etc.**

***for all electrical purposes***

**SIMMONDS & STOKES (NIPHAN) LTD**

MANUFACTURING ELECTRICAL ENGINEERS

Victoria House, Southampton Row, London, W.C.1. HOLborn 2163, 8637

---

**Lead**

**is the natural choice**

**for a**

**Cable Sheath**

A designer of an underground cable knows that this component can expect no maintenance for the whole of its life. Data accumulated from the earliest days of electric cables have proved that lead is flexible, easily jointed, corrosion proof and, above all, that these properties are permanent.

The Technical Personnel of

the Lead Development Association

is available at all times to assist

in your problems

**LEAD DEVELOPMENT ASSOCIATION**

18 ADAM STREET, LONDON, W.C.2

TELEPHONE: WHITEHALL 4175

TELEGRAMS: LEADEVEP, RAND, LONDON

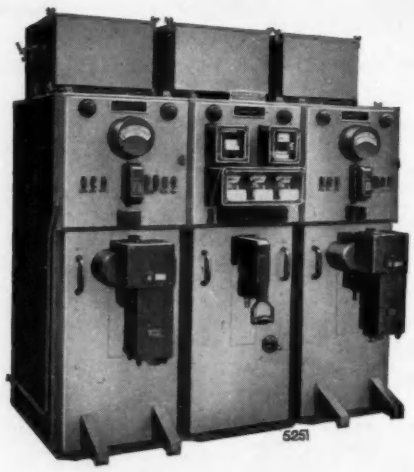
L&C

TYPE AVC

# SWITCHGEAR

11 kV 150 MVA

A.S.T.A. CERTIFIED



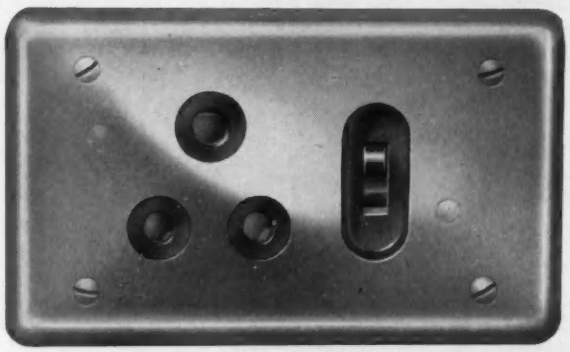

AIR INSULATED
VERTICAL ISOLATION
HORIZONTAL DRAWOUT

**LONG & CRAWFORD LTD.**

GORTON ROAD - MANCHESTER 12

# See the **NEW TEMCO RANGE** of **METAL CLAD** Switch Sockets

**METAL CLAD Switch Sockets are the latest addition to the TEMCO range of electrical accessories. They include Flush and Surface types, 5 and 15 amp. A.C., to B.S.546.**



The Surface type is offered with steel or brass front plate and seamless drawn steel box having five ¾" knock-outs, two at the top and one on each of the other sides. The steel plates provide dolly protection by means of a substantial surround integral with the plate. Brass plates are finished B.M.A.; steel plates and boxes are zinc coated and aluminium stove enamelled, giving a high degree of rust resistance.

The Flush type is offered with brass plates finished B.M.A. or matt chrome.

Both types incorporate semi-positive snap action switches with solid silver contacts mounted on a non-tracking moulded base. The shutter requires the co-operation of all three plug pins to expose the phase tubes. The contact tubes are fitted with retainers to prevent them being permanently deformed.

*Leaflet available on request*

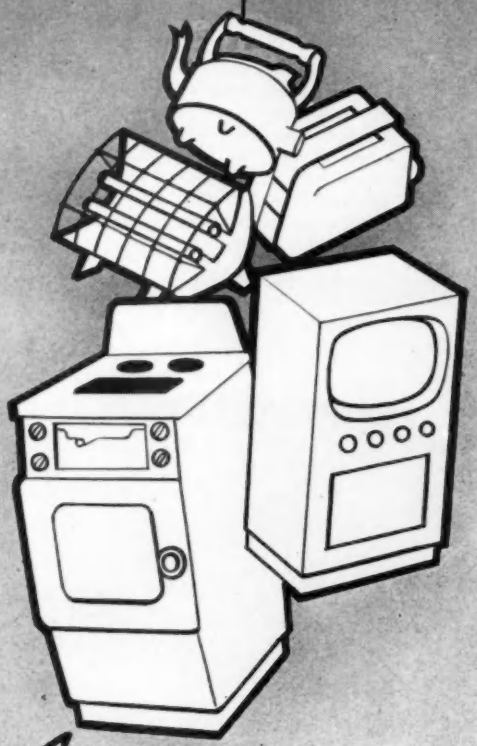
**T. M. C.—HARWELL (SALES) LTD**

**37 Upper Berkeley Street · London W1 · Tel: Paddington 1867-9**

**TEMCO**

# SCOTT

CROMALOY RESISTANCE WIRES & TAPES



*So much depends on them!*

A. C. SCOTT & COMPANY LIMITED
Roundthorn, Wythenshawe, Manchester 23
Telephone: WYThenshawe 5533/5 Grams: Cromaloy, Manchester

dm/A531

BUSHES

A full range of sizes and threads
Conduit
B. S. P.
26 T.P.I.

*Litholite* Plastic Moulders since 1901

LITHOLITE Insulators & St. Albans MOULDINGS LTD.
Sandown Road, WATFORD, Herts. Tel. WATFORD 4494

# COIL WINDINGS

**S.T.S**
CROYDON

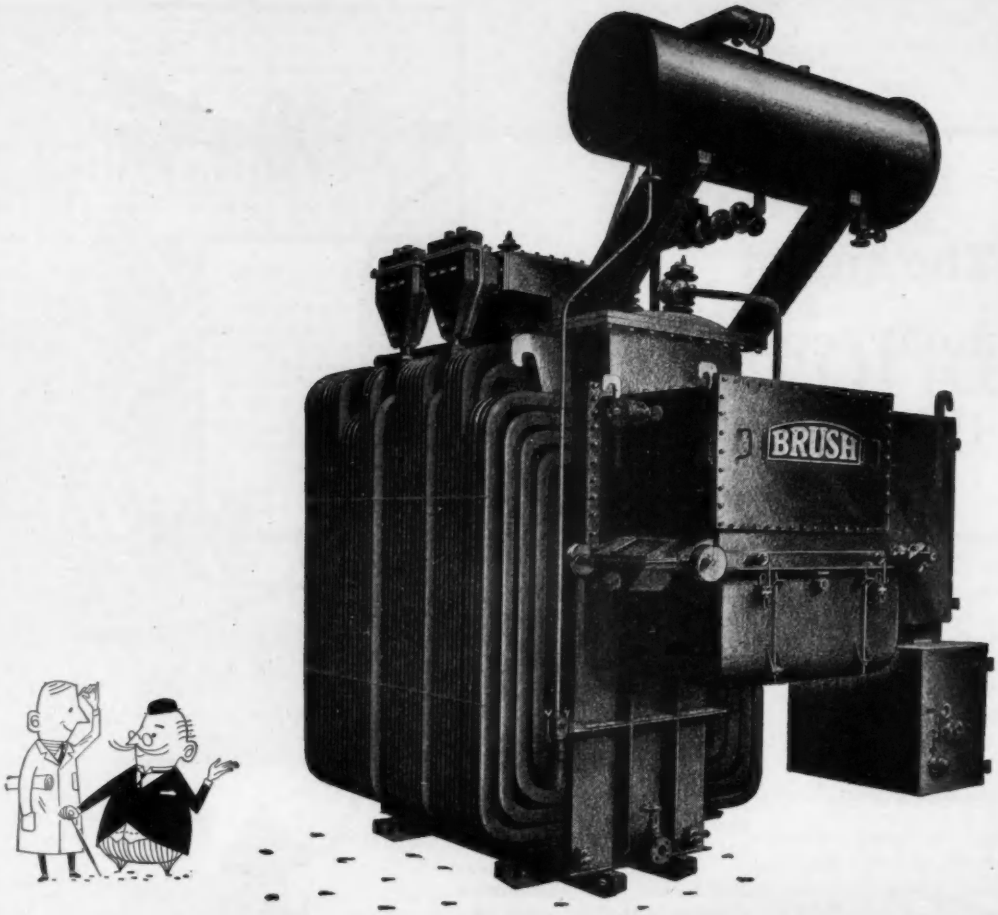
SOUTHERN TRADE SERVICES LTD
Southbridge Rd., Croydon Tel. 2727/8

LIMITED

**MIDLAND METALLICS**
LIMITED

Siddons Factory Estate, Howard Street, Hilltop
West Bromwich, Staffs. *Phone: WEDNESBURY 1489*

**Gravity and Pressure Diecastings**
*of PRECISION*
*QUALITY and DISTINCTION*
In Aluminium and Zinc Base Alloys




# Why must we have a Brush transformer?

Oh, well Sir, you see . . . Well, there's so much one can say . . .

*All right then, say it man. Why Brush?*

Well Sir, first of all I'd like to remind you that Brush built their first transformer as long ago as 1880, and . . .

*Here! Wait a minute. We're not buying for historical reasons are we?*

Of course not Sir, but it's worth remembering that this early transformer was an absolute innovation as far as dependability is concerned, and set a standard for quality that Brush have maintained ever since.

*I see. You mean it's Brush experience plus quality that pays in the long run, eh?*

I do indeed Sir. After all, it's not by accident that Brush transformers are giving such trouble-free service in every part of the world. And another thing. Think of the meticulous research and thorough tests which must have gone into this high-speed resistor-type tap changing gear we're considering, to say nothing of . . .

*All right, I see your point.*

You mean Sir, that we can get in touch with Brush?

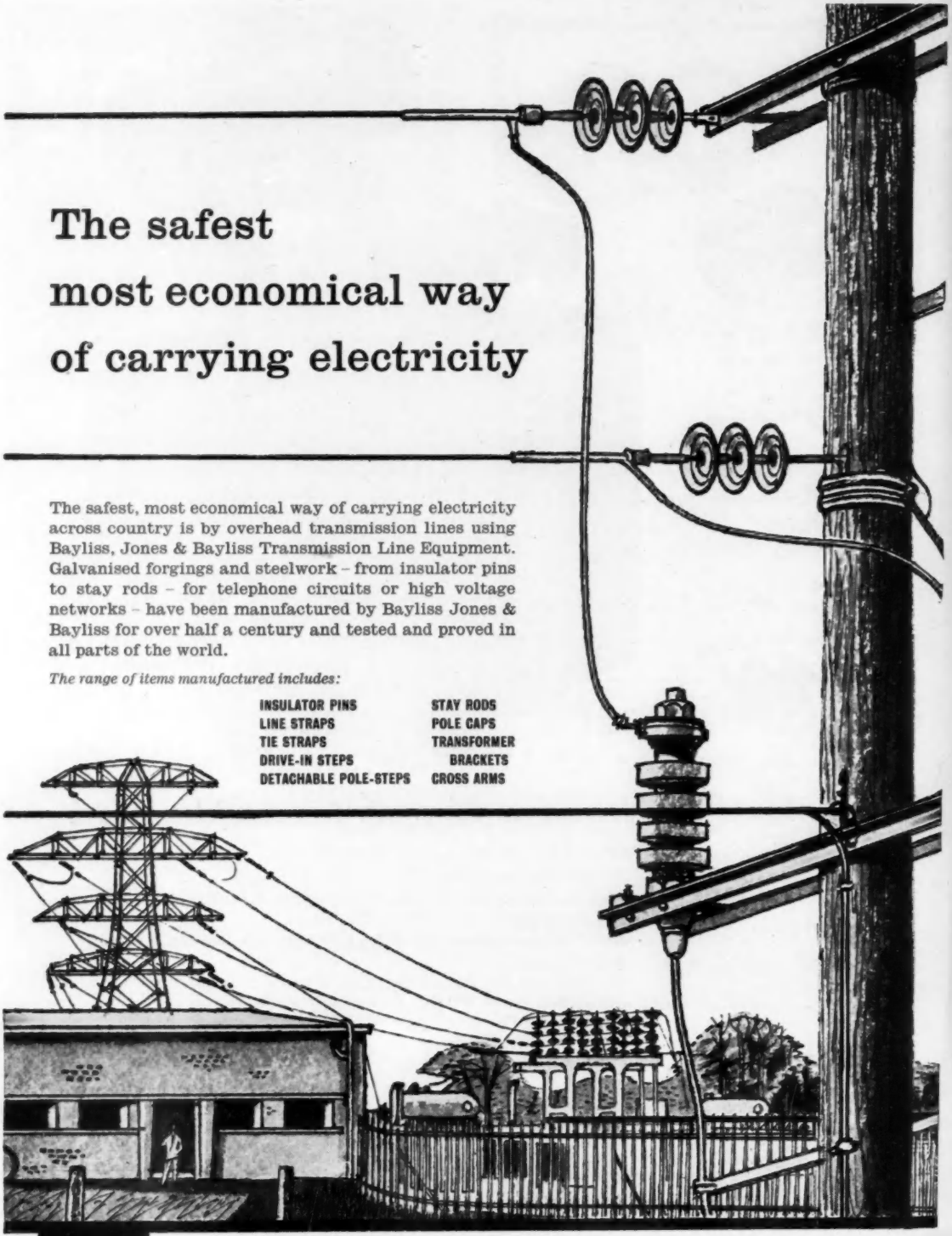
*Of course. What are you waiting for?*

BRUSH
the power people

*For further information on Brush transformers and tap changing gear, write to:*
BRUSH ELECTRICAL ENGINEERING CO LTD • LOUGHBOROUGH
*A Member of the Hawker Siddeley Group*

22

# The safest most economical way of carrying electricity



The safest, most economical way of carrying electricity across country is by overhead transmission lines using Bayliss, Jones & Bayliss Transmission Line Equipment. Galvanised forgings and steelwork – from insulator pins to stay rods – for telephone circuits or high voltage networks – have been manufactured by Bayliss Jones & Bayliss for over half a century and tested and proved in all parts of the world.

*The range of items manufactured includes:*

| | |
|---|---|
| INSULATOR PINS | STAY RODS |
| LINE STRAPS | POLE CAPS |
| TIE STRAPS | TRANSFORMER BRACKETS |
| DRIVE-IN STEPS | CROSS ARMS |
| DETACHABLE POLE-STEPS | |

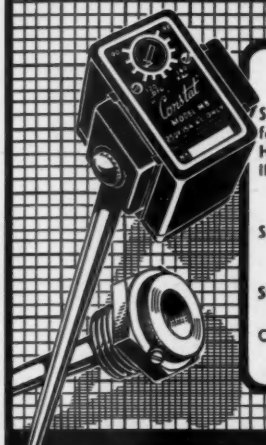
BJB

*For details of standard and off-standard components, please write to:*

**BAYLISS, JONES & BAYLISS LIMITED**

HEAD OFFICE: VICTORIA WORKS · WOLVERHAMPTON · TELEPHONE: WOLVERHAMPTON 20441
LONDON OFFICE: 139 CANNON STREET · E.C.4 · TELEPHONE: MANSION HOUSE 8524

'Constat' CONTROLLERS



MODEL "MB"

STEM TYPE THERMOSTAT for control of IMMERSION HEATERS, PLATENS, DRYING OVENS, Etc.
Suitable for 15 amps, 250 V. A.C. only.

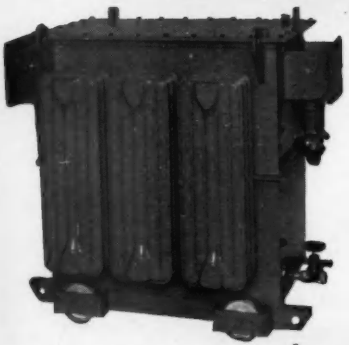
Standard Instrument 11" stem with ½" B.S.P. pocket.

Standard range 90/190° F and 30/90° C.

Other lengths and scales available

THE THERMOSTATIC CONTROLS Co
AVENUE ROAD·HAMPTON·MIDDX.
TELEPHONE: MOLESEY-3285/7

*It's a* **STURDY** *transformer . .*



OVER 25 YEARS' MANUFACTURING EXPERIENCE

*. . . in more ways than one*

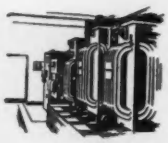
As supplied to Govt. Depts., National Coal Board, C.E.G.B. and many other large industrial undertakings.
From 500 VA to 150 kVA with special emphasis on the range 5 kVA to 150 kVA.

**Sturdy** ELECTRIC CO. LTD.

STURDY WORKS, HAMSTERLEY COLLIERY, NEWCASTLE UPON TYNE
Phone: EBCHESTER 271/2 Grams: Sturditran, Newcastle upon Tyne

BY APPOINTMENT TO HER MAJESTY THE QUEEN
Suppliers of Fire Extinguishers The Pyrene Company Limited

making the electrical world safer from fire



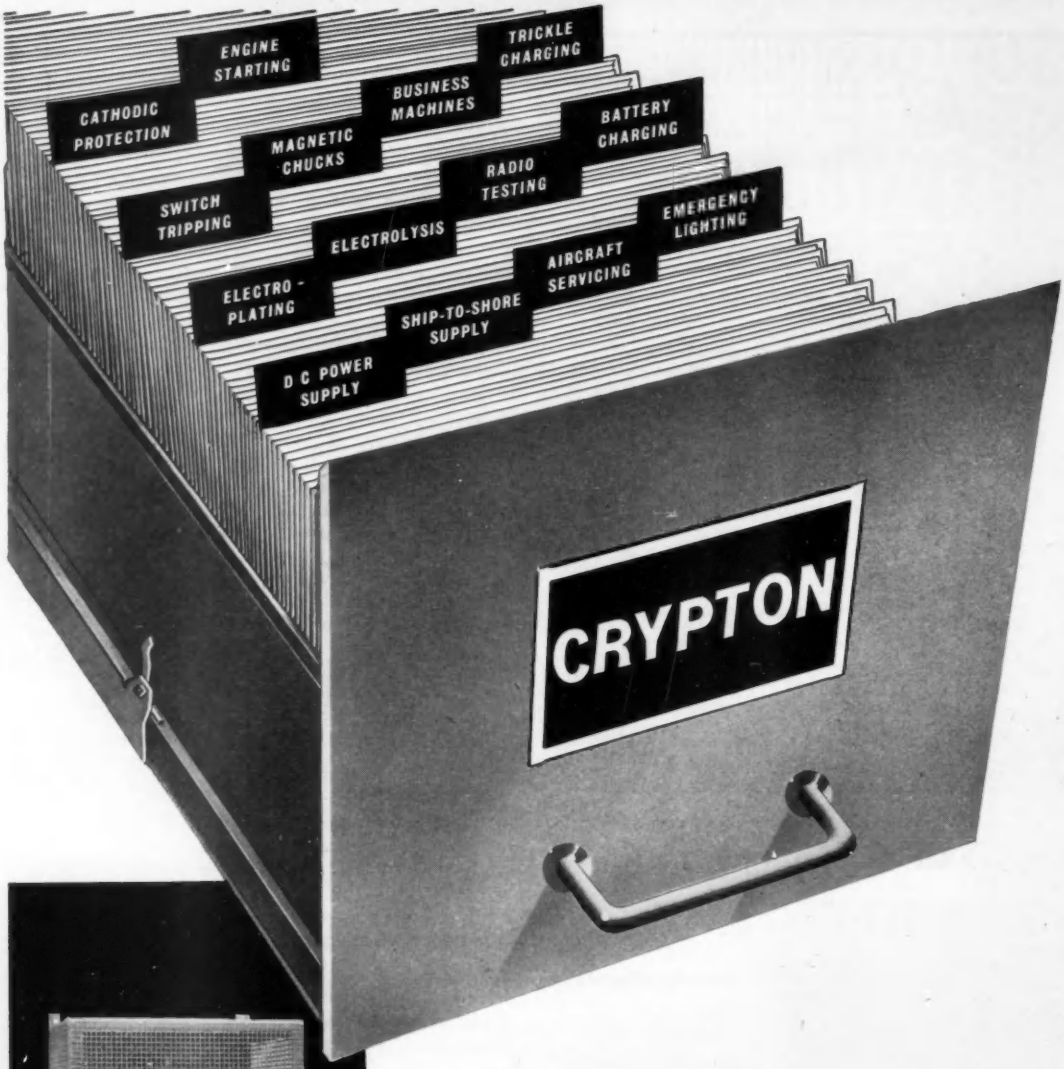
The many and varied fire dangers that are ever present in the electrical industries call for nothing less than the finest methods of fire protection. In this field, the highly developed and specialised Fire Detecting and Extinguishing Systems supplied by The Pyrene Company have a record and reputation second to none throughout the world. Whatever fire problems you have in your works—generating stations, transformer rooms, switchgear, cables — "Pyrene" Fire Protection provides the right answers.

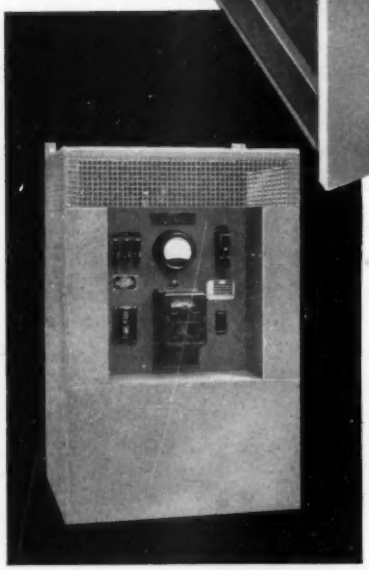
Write for full details or instruct us to send a Technical Representative to give you expert advice without charge or obligation.

Pyrene TRADE MARK FIRE PROTECTION

THE PYRENE COMPANY LTD
(*Dept. E.R.*10) 9 GROSVENOR GARDENS, LONDON, S.W.1
*Tel.:* VICTORIA 3401 *Head Office and Works:* BRENTFORD, MIDDX.
*Canadian Plant:* TORONTO

ER 10



# Re our Rectifiers...

Should you need really well designed, economic, dependable equipment for the supply of D.C. from A.C. mains; equipment that is produced with an eye to quality, it will be well worth your while to send an enquiry to Crypton of Bridgwater. This progressive Lancashire Dynamo company has earned an enviable reputation throughout the world not only for the pre-eminence of its products but also for its prompt, courteous and reliable service.

## industrial rectifiers

**CRYPTON EQUIPMENT LIMITED · BRIDGWATER · SOMERSET · ENGLAND**

TELEPHONE: BRIDGWATER 2614 TELEGRAMS: CRYPTOQUIP BRIDGWATER
LONDON ADDRESS: ST STEPHENS HOUSE VICTORIA EMBANKMENT SWI
A Member of the Lancashire Dynamo Group

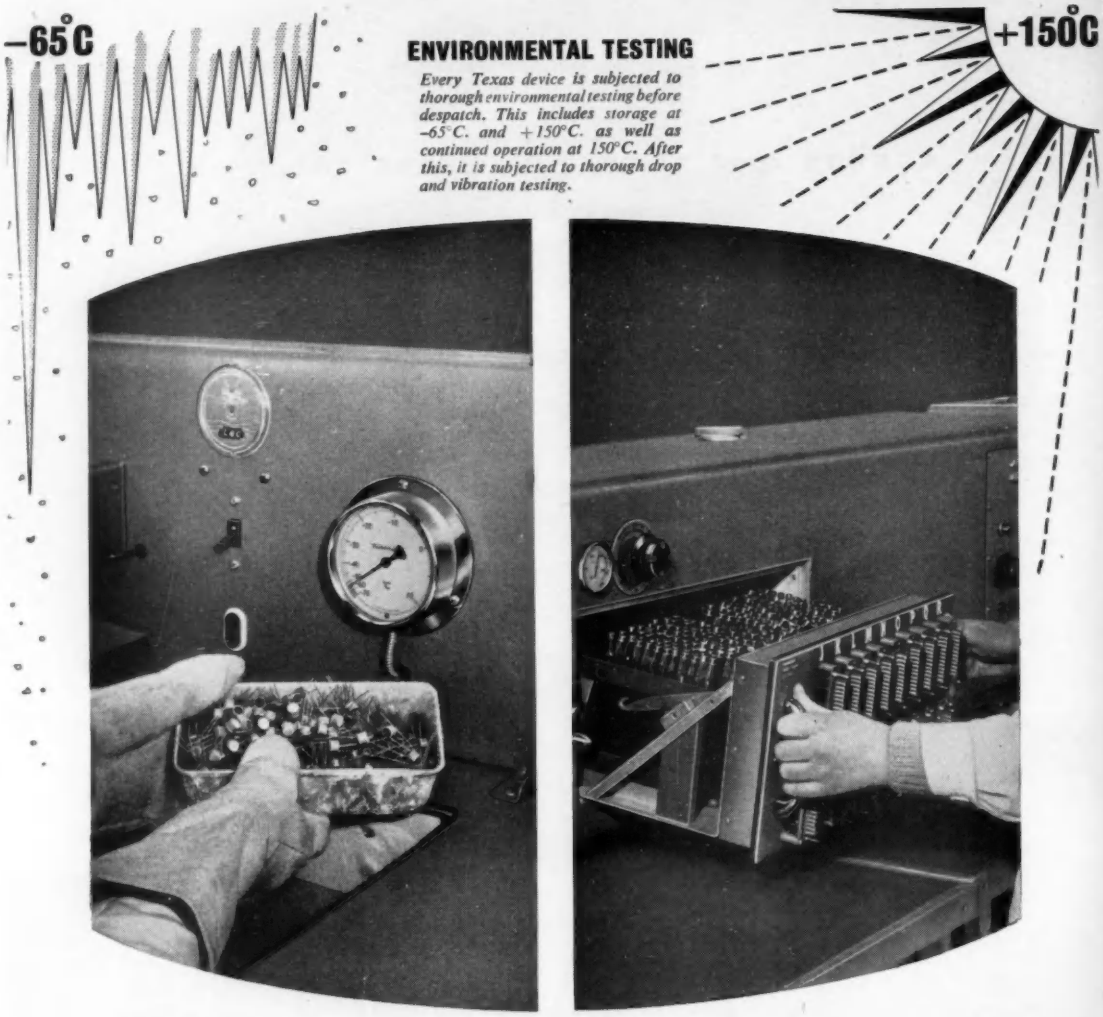
AGENTS AND BRANCHES COVER THE WORLD

# VENTILATED MOTORS

STANDARDISED DIMENSIONS
COMPLYING WITH B.S. 2960

Our "Guaranteed for Ever"
is
Your "Gilt Edge Security"

TRADE
HIGGS MOTORS LTD
MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.
MARK
BIRMINGHAM 6 ENGLAND




**ENVIRONMENTAL TESTING**

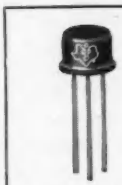
*Every Texas device is subjected to thorough environmental testing before despatch. This includes storage at −65°C. and +150°C. as well as continued operation at 150°C. After this, it is subjected to thorough drop and vibration testing.*

# *NEW* 4 WATT POWER TRANSISTOR

THE NEW TEXAS medium power transistor with a collector dissipation of 4 watts makes possible a high degree of miniaturisation of servo amplifiers. For example a pair in Class 'B' push-pull operating from a 36 volt supply gives 4 watts output, sufficient to drive a size 10 servo motor at full torque.

Additional important features of these new devices are: a minimum alpha cut-off frequency of 4 Mc/s, collector voltages of 60 for the 2S017 and 100 for the 2S018, and a maximum storage temperature of 200°C.

**Circuit design information on these and other Texas power transistors is provided in our Application Report on servo amplifier design.**



ACTUAL SIZE

## TEXAS INSTRUMENTS LIMITED

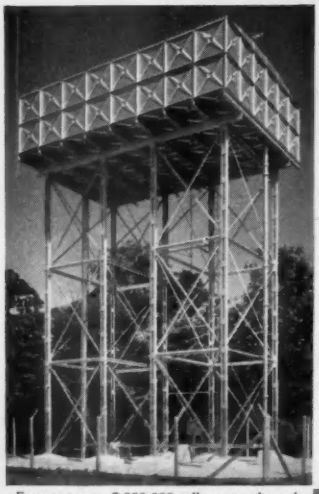
**Pioneers of Semiconductors**

DALLAS ROAD, BEDFORD. TEL: BEDFORD 68051 CABLES: TEXINLIM BEDFORD

T.15

# PRESSED STEEL TANKS

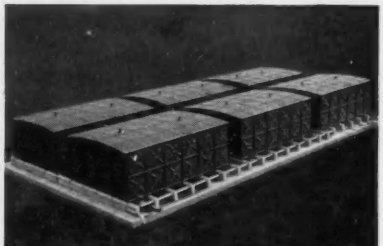
*Pressed Steel Tank for separating oil from refinery effluent. Grangemouth, Stirlingshire, Scotland.*



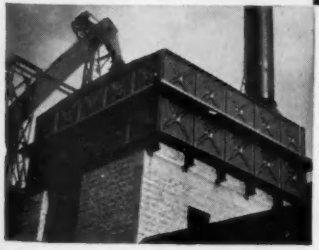
*Every year over 7,000,000 gallons pass through this elevated tank supplying the needs of the rural communities of Madingley and Coton, Cambridgeshire, England.*

The unlimited range of sizes and capacities in which unit constructed Braithwaite Pressed Steel Tanks can be supplied enables Architects, Engineers and Planning Experts to provide reliable storage for most liquids. These tanks, which can be erected at ground level or in elevated positions such as on flat roofs, can also be supplied with steel supporting towers. They are ideal for maintaining adequate supplies for all municipal, civil, industrial and agricultural requirements and can be enlarged when additional capacity is required. The many advantages of this modern form of storage, makes consideration of Braithwaite Pressed Steel Tanks essential where increased productivity through greater efficiency is envisaged and where modest undertakings are to be started.

*Pressed Steel Tank utilised as an architectural feature at a Secondary Modern School, Hunstanton, Norfolk, England.*



*A battery of tanks each containing 23,000 gallons at a frozen food preparation plant, West Lynn, Norfolk, England.*



*A solid fuel bunker which can be converted to store fuel oil, erected on the roof of a laundry, Slough, Bucks, England.*

**BRAITHWAITE & CO. ENGINEERS LIMITED**

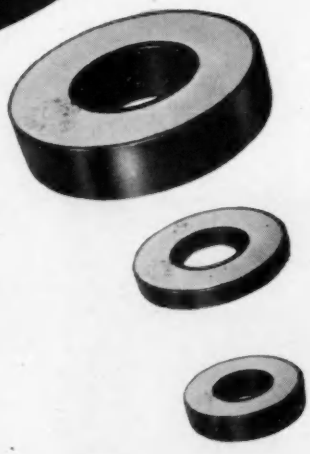
*BRIDGE AND CONSTRUCTIONAL ENGINEERS*

LONDON OFFICE: DORLAND HOUSE · REGENT STREET · LONDON SW1 TEL: WHITEHALL 3993

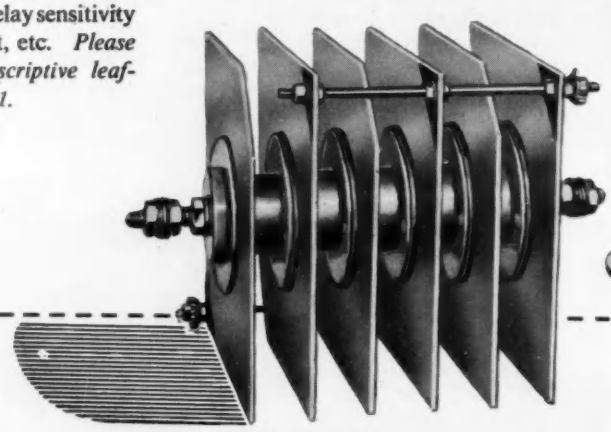
# METROSIL

## Non-linear Resistors

$I \propto V^4$



Metrosil non-linear resistors provide a reliable means of safeguarding all types of electrical equipment against surge voltages. A rise in voltage to twice the normal value increases the current approximately twenty times. Based on silicon carbide, Metrosil is usually made in the form of discs, but rods are also produced for certain applications. These standard products are stable and convenient in size, standard discs ranging from ½" to 6" in diameter. Typical applications for Metrosil products include the protection of field coils, relay coils and solenoids, instrument relays, condensers, tap-changing switches and power transmission lines. Other applications include spark quenching, protection of instruments under fault conditions, relay sensitivity improvement, etc. *Please write for descriptive leaflet No. 220/1-1.*



**METROPOLITAN-VICKERS**

ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

*An A.E.I. Company*

*A New Circuit Component*

N/M 501

INFRA-RED LAMPS — IRONS — KETTLES — ELECTRIC FIRES — BOILING RINGS — SPACE HEATERS — AIRING CUPBOARD HEATERS

SPIRALS AND ELEMENTS REPLACEMENT

# METWAY

SMART, SWIFTLY SELLING APPLIANCES
— NOT SLOW SHELF STOCK!

"SUPERWAY" 600 watt Bowl Fire 18/6 plus 3/3 P.T.
"DANDYWAY" 750 watt Boiling Ring 19/8 No P.T.
"MIDGETWAY" 750 watt Electric Kettle 30/3 plus 6/6 P.T.
"FROSTAWAY" 25, 60 and 100 watt Heater 11/11 plus 2/7 P.T.

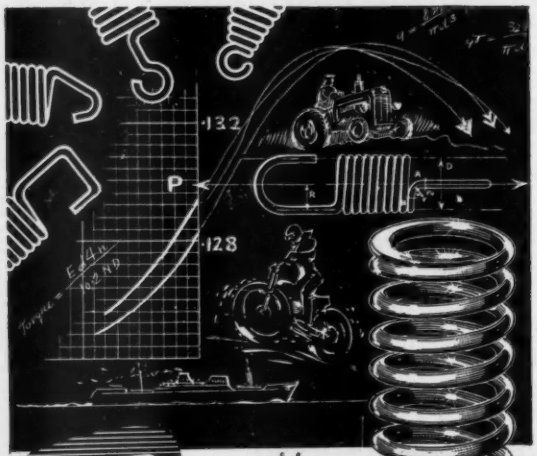
For more details of these and our other appliances ASK FOR OUR NEW APPLIANCES CATALOGUE No. DAR/10ER

METWAY WORKS · KEMPTOWN · BRIGHTON

INFRA-RED LAMPS — IRONS — KETTLES — ELECTRIC FIRES — BOILING RINGS — SPACE HEATERS — AIRING CUPBOARD HEATERS

REPLACEMENT ELEMENTS AND SPIRALS






# Ratcliffe SPRINGS

F. S. RATCLIFFE (Rochdale) LTD.
CRAWFORD SPRING WORKS, NORMAN ROAD
ROCHDALE
Phone: Rochdale 4692/3 Grams: "Recoil, Rochdale"



*The roller lever is an optional feature.*

## SNAP ACTION LIMIT SWITCHES

Accuracy and reliability are vital musts in machine tool control. That's why the popular choice in limit switches is BROOKHIRST snap action type. Positive quick make and break changeover contacts; splash-proof or watertight enclosure; tested to 20,000,000 operations. Full details in Leaflet 2103. Send for your copy now.

BROOKHIRST
BROOKHIRST SWITCHGEAR LTD.
NORTHGATE WORKS, CHESTER.
A METAL INDUSTRIES GROUP COMPANY

CVS-66

# TYERS JOINTERS EQUIPMENT

*For Dependability*

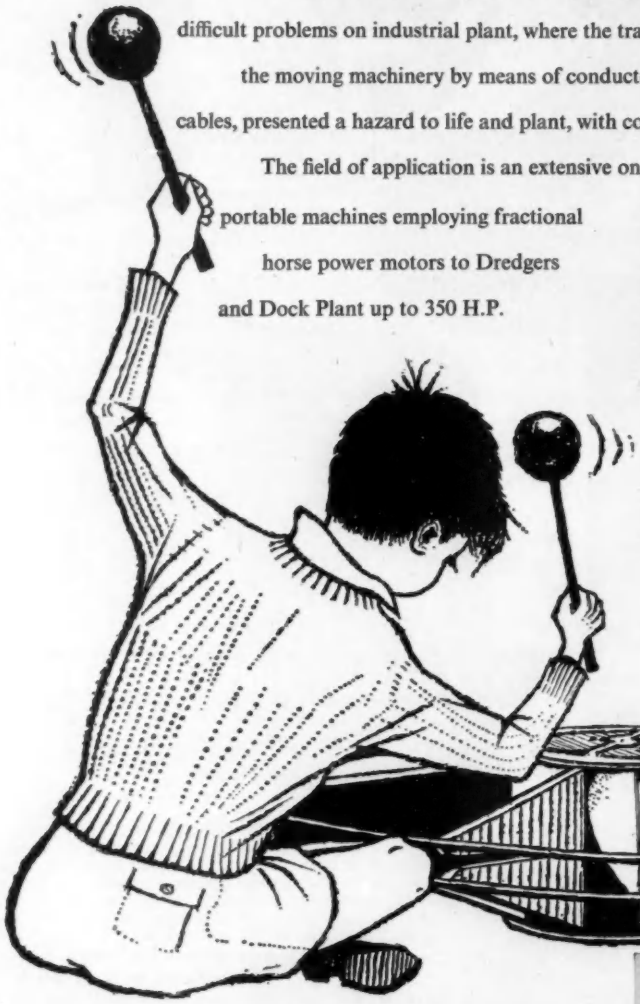
The only choice in 1885... Still the BEST today!

PORTABLE FURNACE AND PATENTS CO.
CARRINGTON NOTTINGHAM
*Telephone 64887 Telegrams 'FURNACE NOTTINGHAM'*

# *you can't beat this drum*

DECO Cable reeling drums were designed and developed to solve one of the most difficult problems on industrial plant, where the transmission of electrical supply to the moving machinery by means of conductor rails, trolley wires, or loose trailing cables, presented a hazard to life and plant, with consequent loss of production.

The field of application is an extensive one, ranging from small portable machines employing fractional horse power motors to Dredgers and Dock Plant up to 350 H.P.



## range of DECO equipment includes:

Special Electrical Equipment for every class of Handling Plant. Winch Limiting Mechanisms with special quick reset features, Shunts and Ultimate Series Type, Float Controls.

Contact Collector Columns for all classes of Cranes, Slurries, Turntables, Mixers, etc. Emergency chain and wire operation system trip switches. Centrifugal Switches. Special limit and control switches, push buttons and auxiliary devices for automatic operation of Material Handling Plants.

"DECO" patent Hose Reeling Drums, Patent No. 370,076/32, for use with Fluids, Overhead collector equipment up to 650 volts D.C. 6,600 volt Reeling Drums for special applications.

ASSOCIATED COMPANY: **GRILL FLOORS LTD** manufacturers of: Grill Floors for Platforms and Mezzanine Floors, Steel Lattice Ladders, Patented Hand Railing, Grills for Coal Screens, Access Ladders with Convex Visible Edge Stairtreads, Window Cleaning Galleries, Trench Gratings, Duckboards, Servo Docks, Vehicle Washes, Scaffold Boards.

An illustration of a counter-weight operated radial reeling drum accommodating 130 feet of 4-core 1.3" overall diameter reinforced trailing cable for a 40-ton Goliath crane. (Photograph by kind permission of Messrs. Stothert & Pitt Ltd.)

# DECO

*cable reeling drums*

DECO ENGINEERING CO LTD WEST ROW NORTH KENSINGTON LONDON W10

*Tel: Ladbroke 3066/7 Grams: Etyladec Wesphone London*

P.794

# Buy NIFE Lamps now for years of light

NIFE PORTABLE LAMPS are powered by all-steel alkaline batteries which won't corrode or self-discharge. You can leave a Nife lamp standing idle for months or even years—and it will work the first time you touch the switch. Nife lamps are lighting the way for public works engineers, railway engineers, fire brigades, civil engineers, oil companies and hospitals . . . down mines, aboard ship and in every branch of industry.

**NIFE SEARCHLIGHT S6**

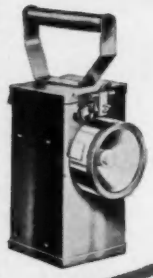
Gives 3 hours' light on 3.0 amp. main filament or 20 hours on reserve filament. The beam of light equals that of a motor car headlamp. Approved by the Ministry of Fuel & Power.

**NIFE HEADLAMP NC113C**

Gives 10 hours' light on main high efficiency 1.0 amp. Krypton gas-filled bulb. Fitted with pilot bulb for emergency. Approved by the Ministry of Fuel & Power and Ministry of Transport.

**NIFE HANDLAMP NH10A**

Sturdy all-purpose inspection lamp weighing only 4 lb. Gives approximately 10 hours' light per charge. Approved by the Ministry of Fuel & Power and Ministry of Transport.



✻ **ILLUSTRATED LEAFLETS** about these and other Nife lamps will be gladly sent on request to: Nife Batteries, Redditch, Worcestershire.

**NIFE** *batteries won't corrode* N.129

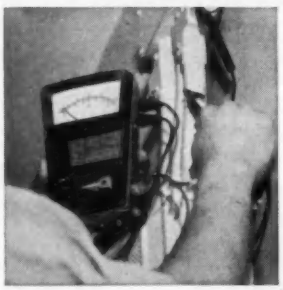
# *Meet the New* METROHM

## INSULATION AND CONTINUITY TESTER

**TRANSISTORISED!**

**PRINTED CIRCUIT!**

**ONE-HAND OPERATION!**



It's the most significant advance in insulation and earth continuity testers for years.
Really thoughtful planning and design give the METROHM many important advantages.
*Here are some:*

1. Transistorised for high conversion efficiency.
2. Printed circuit for extra reliability.
3. Easy one-hand operation.
4. Clear-reading protected dial.
5. Moulded front panel set in a fibre-glass case.
   250 and 100 volt models also available.
   *For fuller technical description and applications write for Sheet 242 A.*
6. 500-volt insulation and continuity tests combined in a single instrument.
7. Practically ripple-free — only 0.1% ripple.
8. Long battery-life.
9. Good design and quantity production combine to keep the price low.

**PRICE:** *complete with detachable polythene front cover, leather sling strap and 5' test leads fitted with crocodile prod clips* **£21.12.0d.**

EVERETT EDGCUMBE & CO. LTD.

COLINDALE WORKS, LONDON, N.W.9
Telephone: COLINDALE 6045
LONDON OFFICE: COLUMBIA HOUSE, ALDWYCH, W.C.2

*Branch Offices:* BIRMINGHAM · CARDIFF · GLASGOW · MANCHESTER · SHEFFIELD

DHB/6036

"Yes, WOOTTON meter boards!"

"There's none better. I say THERE'S NONE BETTER. When you fix a Wootton Meter Board it's fixed for keeps. Unaffected by climatic changes — no contraction or expansion. Wootton means that extra something that makes all the difference."

**and wood blocks • sunk switch boxes • instrument cases**

**WOOTTON & CO. LTD. · ALMA WORKS · PONDERS END · MIDDLESEX** · *Telephone: Howard 1858*

# L.E.F. ELECTRIC WINCHES
## portable & self-contained

After using one of these L.E.F. electric winches, Metropolitan Vickers Co., Ltd., of Manchester, found it so satisfactory that they placed an order for three more.

Portable, self-contained and capable of handling loads of up to 2½ tons, these winches are made with the skill and precision which characterises all L.E.F. winches.

Send for details of standard equipment or we shall be glad to manufacture to your special requirements.

*London Electric Firm Ltd.*
*Brighton Road, South Croydon, Surrey*
*Telephone: Uplands 4871*

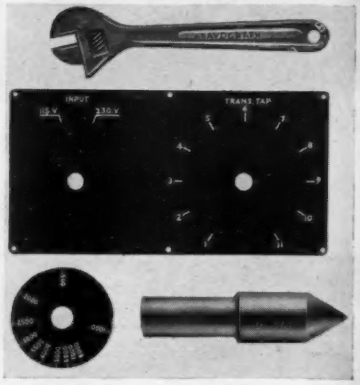
L&F

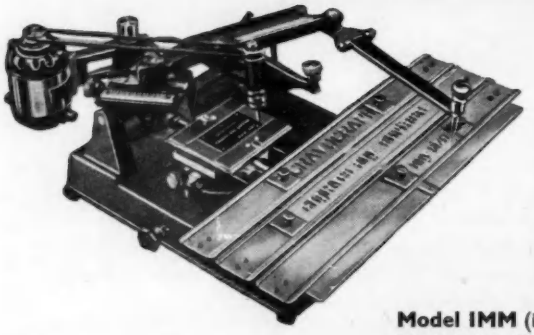
Tib. 97

*Industrial Engraving with*

# Gravograph Speeds production

TRADE MARK





## WITH UNSKILLED LABOUR

you may do your own engraving, saving money and time.

Engrave your tools, plates, plastics, glass, electric fittings, etc.

**Model IMM** (illustrated) for general work.
**Model IS** will engrave panels up to 25" deep by any length.
**Model IT** Your articles up to 8½" in diameter by any length. Panels up to 13" deep by any length.

*Descriptive literature and full details from*

**VITOS LTD., 13 Charlotte Street, London, W.1** **LANgham 6171-2**

## *Reliable under load*

If you are a Manufacturer of
**SPIN DRYERS**
**TAPE RECORDERS**
**IRONING MACHINES**
**VACUUM CLEANERS**
**FLOOR POLISHERS**
**AIR CONDITIONING**
**DRYING CABINETS**
**FAN HEATERS**
**or other electrical products using motors**

*Write or 'phone for fully descriptive Leaflet No. F.H.P.21*

*Hillman*

**ELECTRIC MOTORS LTD.**
CRANE GROVE • LONDON, N.7
*Telephone: NORth 5891/5892*

OVER 60 YEARS OF CABLEMAKING

*Specialist Manufacturers of*

## FLEXIBLE CABLES & CORDS

*to B.S.S., G.D.E.S., etc., specifications*

TRADE MARK EST. 1885

**Lighting, Power, Dynamo, Lifts, Welding and Trailing, V.I.R. and T.R.S., Asbestos and Flame-Resisting, Enamel, Silk, Cotton and Glass Insulated Wires, Bare Copper Braids, Non-Rubber Flexibles, Plaited Copper Braids and Cords, P.V.C.-Polythene, P.V.C.-Microphone, Screened, Armoured, etc.**

**SAXONIA**
**ELECTRICAL WIRE COMPANY LTD.**

*Contractors to the Admiralty, War Office and Air Ministry, etc.*
Offices and Works: **ROAN WORKS, GREENWICH, S.E.10**
Grams: "SAXONIST, LONDON." Phones: GREenwich 0463 & 3713
"GREENWICH" CABLES AND FLEXIBLES

## METWAY *means* ELEMENTS

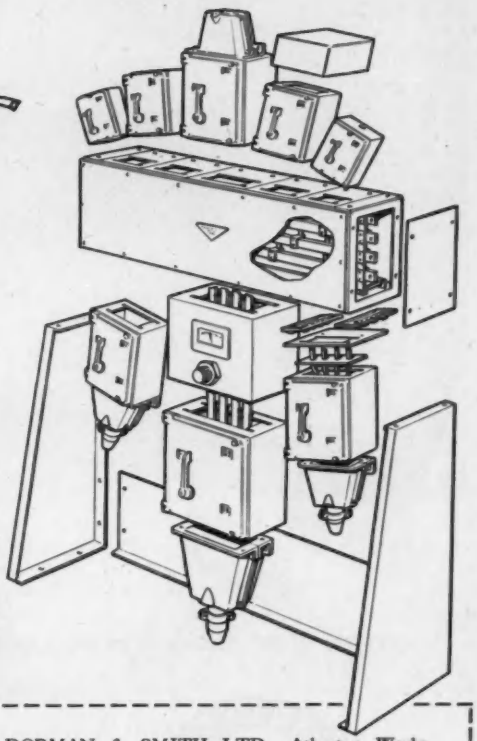
BETTER STOCK UP NOW AND BE SURE TO SPECIFY METWAY!

If you would like a copy of our 56 page catalogue—
ASK FOR CAT. No. MYP/3ER

**METWAY WORKS KEMPTOWN BRIGHTON**

# Suffering from "GROWING PAINS?"

## YOU NEED THE DORMAN SYSTEM



One factor on which high productivity depends is the adequate distribution of electric power. Even if your plant or warehouse can't grow in size it can grow in production capacity and output. Do you realise that the compact design of the DORMAN SYSTEM not only means more power output in less space, but also permits easy and economical extensions when required? You should investigate the advantages of the DORMAN SYSTEM now!

**DORMAN & SMITH LTD.**

**PRESTON** Atherton Works, Blackpool Road, Preston, Lancashire. Tel: Preston 86785 (6 lines)

**LONDON** 125 High Holborn, W.C.1 Tel: CHAncery 6431

**BIRMINGHAM** 2/3 Graham Street, Birmingham 1. Tel: CENtral 2009

**GLASGOW** 249 St. Vincent Street, Glasgow, C.2. Tel: CENtral 2479

To DORMAN & SMITH LTD., Atherton Works, Blackpool Road, Preston, Lancashire.

*Please send latest Dorman Switchgear & Switchboard Catalogue*

NAME .....

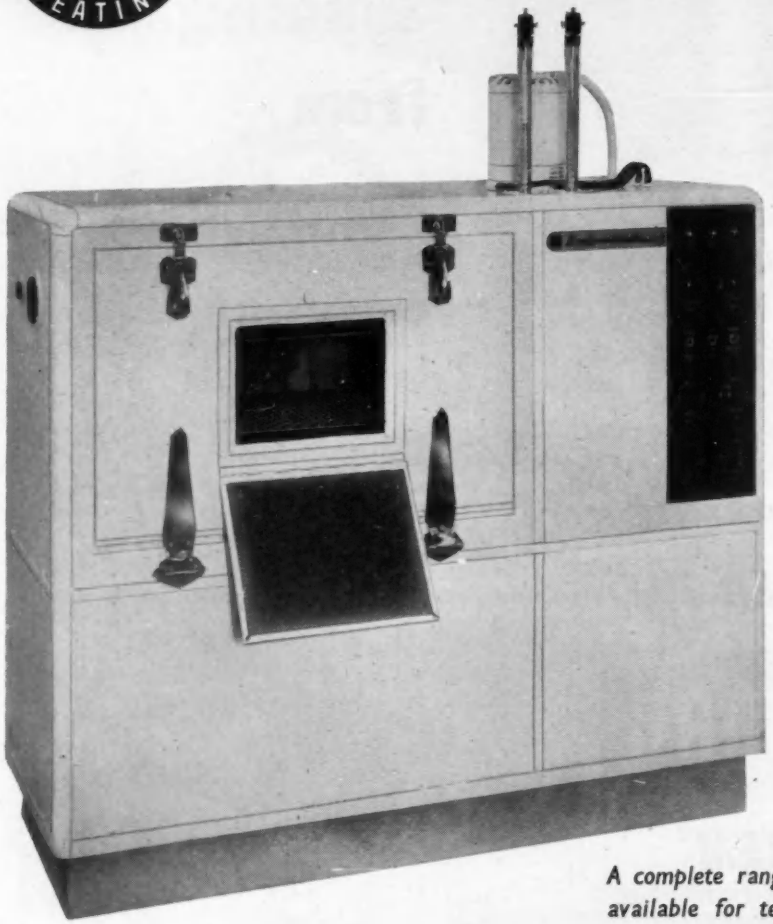
POSITION .....

FIRM .....

ADDRESS .....

ER/10/58

# HUMIDITY TEST CABINETS AND TROPICAL CHAMBERS



ACCEPTED FOR DEFENCE SPECIFICATIONS INCLUDING

RCS 11
K 114
DTD 1085B
etc

WRITE FOR FURTHER DETAILS QUOTING REFERENCE I E D

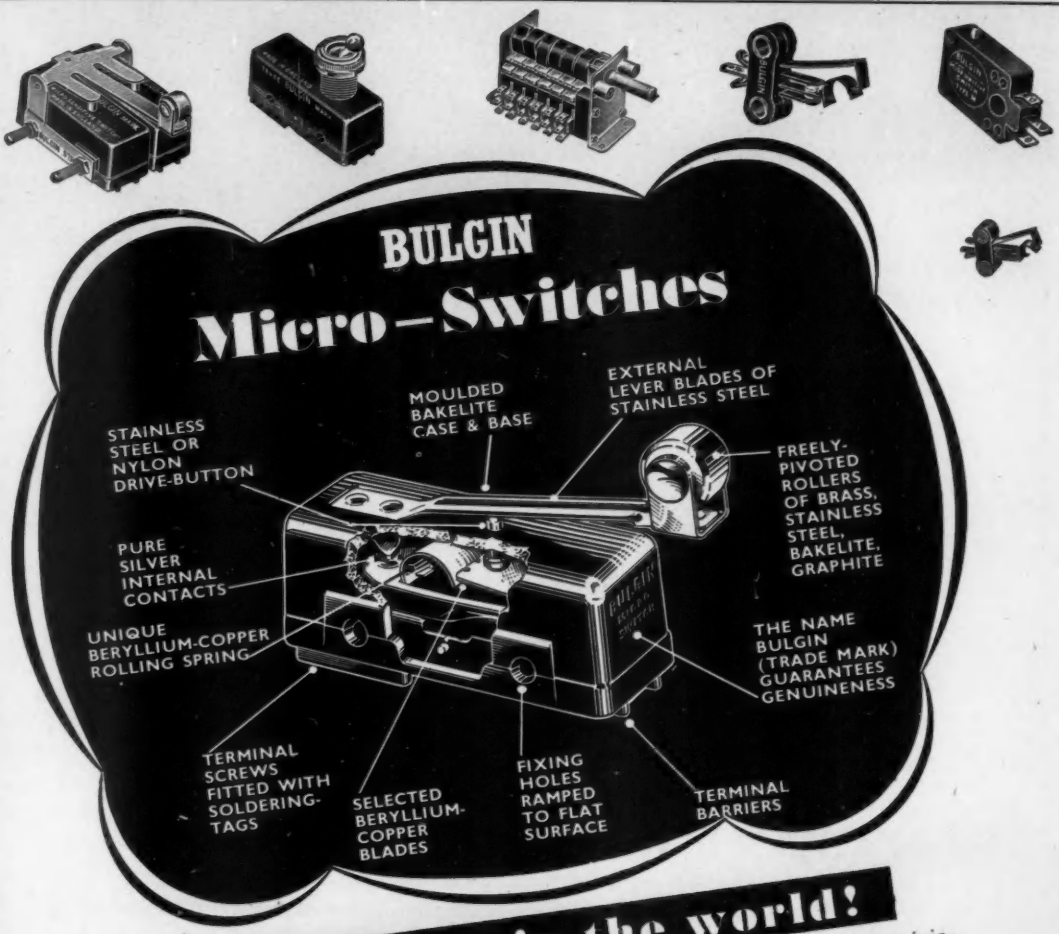
*A complete range of standard types and sizes available for testing components or complete assemblies to official specification*

OTHER 'B-W' PRODUCTS INCLUDE: FURNACES, OVENS, IMPREGNATING PLANT

Barlow-Whitney

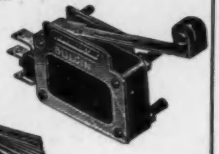
BARLOW-WHITNEY LTD., 2 DORSET SQUARE, LONDON, N.W.1. Tel.: AMBassador 5485. Works: London & Bletchley

BMJ


BULGIN
Micro-Switches
STAINLESS STEEL OR NYLON DRIVE-BUTTON
MOULDED BAKELITE CASE & BASE
EXTERNAL LEVER BLADES OF STAINLESS STEEL
FREELY-PIVOTED ROLLERS OF BRASS, STAINLESS STEEL, BAKELITE, GRAPHITE
PURE SILVER INTERNAL CONTACTS
UNIQUE BERYLLIUM-COPPER ROLLING SPRING
THE NAME BULGIN (TRADE MARK) GUARANTEES GENUINENESS
TERMINAL SCREWS FITTED WITH SOLDERING-TAGS
SELECTED BERYLLIUM-COPPER BLADES
FIXING HOLES RAMPED TO FLAT SURFACE
TERMINAL BARRIERS

**...the best in the world!**

The largest range of precision-made Micro-Switches manufactured; standard, miniature, open, lilliputian and ganged. Thousands and thousands in continuous use, everywhere, on all kinds of duties. Full details of scores of types in one complete catalogue No. 199/ER (Free to Trade-letterhead or order).



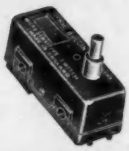
THE CHOICE OF CRITICS

THE HOUSE OF

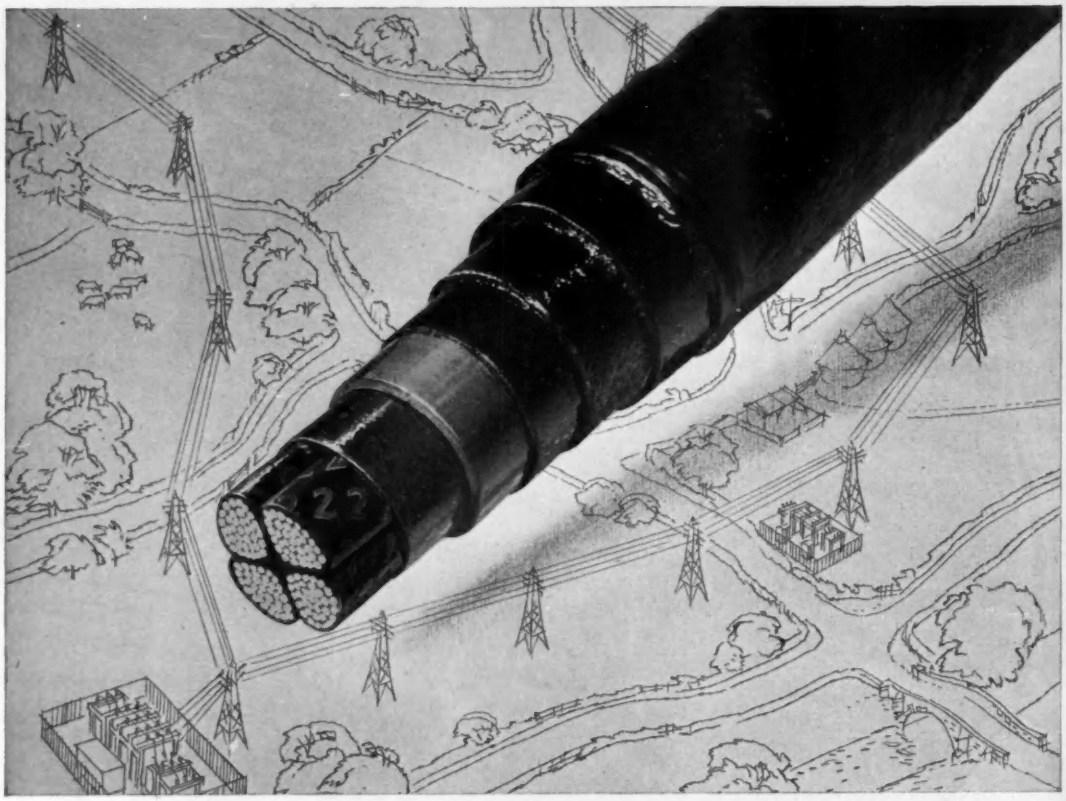
**BULGIN** *components*

**A. F. BULGIN & CO. LTD. BARKING, ESSEX**

TELEPHONE: RIPPLEWAY 5588



*MANUFACTURERS OF RADIO AND ELECTRONIC COMPONENTS*



# Worthy of their vital role!..

It goes without saying that in the manufacture of Britannic Cables are concentrated a wide knowledge of materials, latest manufacturing technique and conscientious craftsmanship. That's why their quality and reliability has earned the confidence of engineers all over the world . . . why Britannic cables are now specified more than ever before.

What does need to be emphasised is that Britannic Cables have established themselves over the years as an independent company, supplying the electrical distribution industry and also have been concerned with all types of electrical power installations both at home and overseas.

*All cables made by Britannic conform to the relevant requirements of the British Standards Institution.*

*SPECIFY BRITANNIC FOR YOUR NEXT PROJECT!*

**BRITANNIC CABLES**

**BRITANNIC CABLES LIMITED**

IVER Telephone : Iver 491 Telegrams : Britannic, Iver BUCKS

# You'll see him here . .
# You'll see him there . . .
# You'll see him nearly everywhere

From one end of the country to the other this autumn this man will be hard at work bringing customers into your shop. On every commercial television station, in prominent positions in the press, on hoardings, bus sides, in window displays, in what is perhaps the most remarkable advertising campaign ever devised by a lamp manufacturer, he will be putting over this simple, commonsense message 'Get lamps you can rely on! Get Atlas lamps . . . they're 8-way tested'!

Turn his work to your advantage. Give him a place in your shop. Use the free, compelling display material Atlas have devised to link up with this powerful publicity plan. Above all, when ordering your lamps be sure to

*get lamps you can rely on—*

*get* **atlas lamps**

*—they're 8-way tested*

Atlas Lighting Limited,
a subsidiary company of
Thorn Electrical Industries Limited,
233 Shaftesbury Avenue, London, WC2

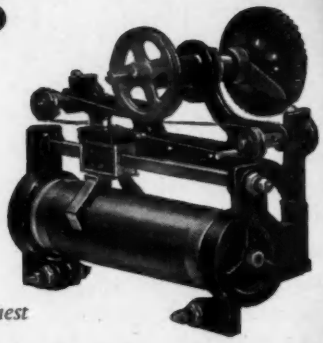
ZENITH

(REGD. TRADE-MARK)

# TUBULAR SLIDING RESISTANCES

*Back-of-Board Types*

As with our Standard Types, these Resistances are made in a great variety of sizes. Likewise, they are extremely durable and robust and incorporate many novel and exclusive features.



*Illustrated catalogue of all types free on request*

**THE ZENITH ELECTRIC COMPANY LTD.**

ZENITH WORKS, VILLIERS ROAD, WILLESDEN GREEN, LONDON, N.W.2

Telephone: WILlesden 6581-5 Telegrams: Voltaohm, Norphone, London

MANUFACTURERS OF ELECTRICAL EQUIPMENT INCLUDING RADIO AND ELEVISION COMPONENTS

---

*for*

# MICA TAPES

*INSULATION*

*Consult*

**EAST LONDON MICA WORKS**

**RINGWOOD RD., WALTHAMSTOW, LONDON, E17**

*ESTD. 1912*

*Phone:* COPpermill 2248/9 *Telegrams:* Elmicmer, Easphone, London

MS

# SILICONES

*serve the electrical industry*

PAGE 1

## Higher performance, fewer breakdowns with MS silicone insulation

***Silicone-insulated dry-type transformers are safer!***

Four 56 kVA Class H transformers incorporated in a Westinghouse rectifier equipment. This is part of a 12,000 kVA installation comprising 243 Class H transformers made by Transformers (Watford) Ltd. The installation supplies heavy current to electrolytic tinning lines at the Velindre Works of the Steel Company of Wales.

By taking full advantage of the new Class H and Class C insulation ratings, dry-type transformers can be made smaller and lighter in weight than O.N. or Class B units and are free from fire or explosion risks. They can be placed at load centres making shorter low-voltage cable runs possible. Class H and Class C dry-type transformers are easily maintained, dust, humidity and ventilation proving no problem.

Midland Silicones Ltd. manufacture the full range of silicone resins and elastomers used by transformer manufacturers in the construction of silicone-insulated dry-type units.

*(Photograph by courtesy of Westinghouse Brake & Signal Co. Ltd.)*

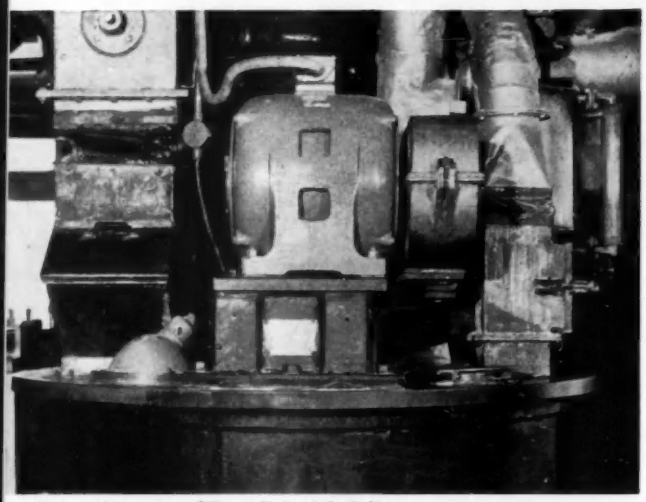
tmw/ms 99

**MIDLAND SILICONES LIMITED**

PAGE 2

# MS silicone motor rewind saves £400

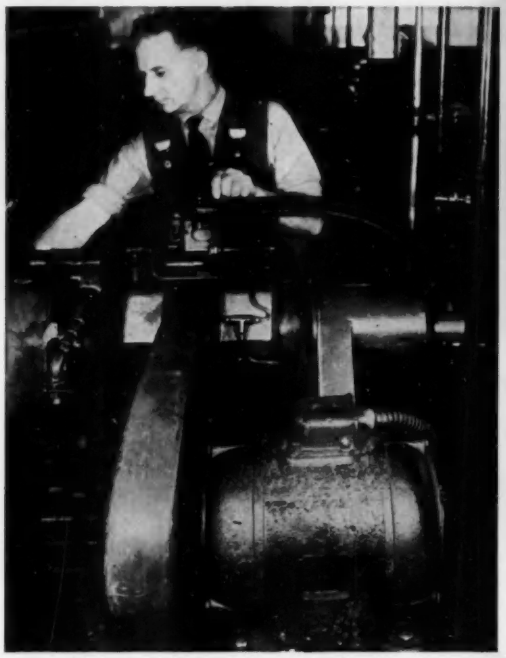
Thomas Hedley & Co. Ltd., at the company's West Thurrock factory, found that one of their motors working in a particularly wet position broke down at average intervals of six months. Rewinds were tried in Class A insulation (costing £30 each time) and in Class B insulation with extra varnish dips to give additional protection against moisture—both without success. Finally they tried a silicone rewind. This was nearly seven years ago and the motor has been operating since without failure, thus saving approximately £400 in rewind costs. In addition losses in production time due to motor failure have been eliminated.



*(Photograph by courtesy of Thomas Hedley & Co. Ltd.)*

MS Silicones strengthen the weak link in all forms of electrical equipment—its insulation. With silicone-insulated motors the risk of breakdown through insulation failure is very greatly reduced. Have your most troublesome motors rewound with silicone insulation.

**MIDLAND SILICONES LIMITED**



*(Photograph by courtesy of Hoffmann, Gloucester Ltd.)*

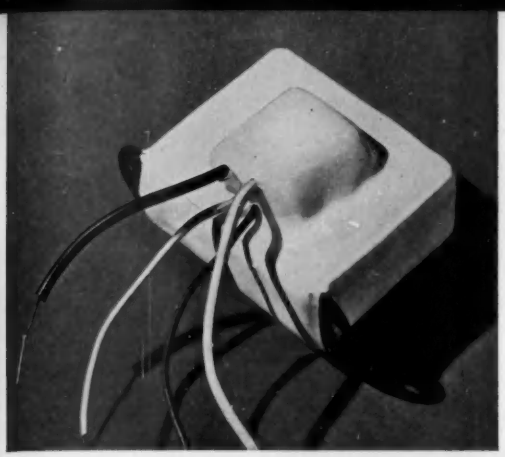
# MS silicone-insulated motors withstand years of continual 'plugging'

The photograph shows a silicone-insulated motor operating at the Stonehouse Works of Hoffmann, Gloucester Ltd., who have kindly provided us with the following information. "We have a bank of 12 machines, each being driven by a 2 h.p. 1425 r.p.m. motor and as the motors burnt out they have been rewound with silicone insulation by British Electrical Repairs Ltd., and this has proved very satisfactory over the past 2 to 3 years.

These motors are working in unusual conditions, as the following description of their working cycle shows, and they stand up to the work very well indeed.

A complete operation takes 12 seconds then the machine is operated to reload which takes 2 seconds. To decelerate rapidly to the stop position for loading the operator presses the stop button followed by 'plugging' (pressing the reverse button). This is drastic treatment when continued all day and speaks well for the rewound motors."

This is a typical example of how MS silicone insulation increases the life and reliability of hard working motors . . . saves money by reducing the need for frequent rewinds and replacements.



PAGE 3

## New MS 'do-it-yourself' rubber for encapsulating electrical components

MS Cold-Curing silicone rubber needs no heat to cure—a simple technique enables it to be applied even by unskilled operators—the addition of a catalyst is all that is required to cure at room temperatures. The curing time may be varied from a few minutes to several hours according to the proportion of catalyst added. MS Cold-Curing rubber possesses the excellent dielectric properties, heat endurance and high thermal conductivity associated with silicone rubbers. The material retains its resilience at both high and low temperatures (−50°C to +300°C) and has excellent resistance to weathering and oxidation.

MS Cold-Curing silicone rubber opens up new fields for designers. It can be used to fill voids around lead wires of coils and motors, for impregnating coils and for other sealing or potting applications.

MS Cold-Curing silicone rubber is also used for making flexible moulds in which epoxide resins are cast.

TYPICAL PROPERTIES OF MS COLD-CURING SILICONE RUBBER

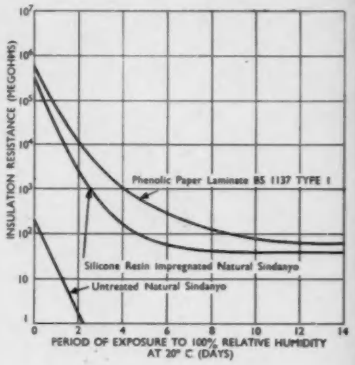
| | |
|---|---|
| Tensile strength lb./sq. in. | 450 |
| Electric strength, on 10 mil sample, ¼-in. electrodes in oil at 20°C instantaneous value, V/mil | 400 |
| Permittivity, at 1 Mc/s | 3.20 |
| Volume Resistivity, ohm.cm, 500 Volts D.C. | $1.5 \times 10^{14}$ |
| Power Factor, at 1 Mc/s | 0.006 |

## 'Natural Sindanyo'* improved by MS resin impregnation

The Steel Company of Wales Ltd., have, for some time, used a resin bonded wood material for panels for mounting contactor control gear. Several fires occurred in some hot and dirty locations when surface contamination of the panels resulted in tracking and breakdown. This Company have now decided to use Silicone Resin Impregnated Asbestos Board in place of the wood material in these locations and, at present, carry out the impregnation process themselves using MS Silicone Resins.

THE EFFECT OF HUMIDITY ON THE INSULATION RESISTANCE OF NATURAL SINDANYO BOARD

Test methods based on B.S. 1137 appendix H


INSULATION RESISTANCE (MEGOHMS)
Phenolic Paper Laminate BS 1137 TYPE 1
Silicone Resin Impregnated Natural Sindanyo
Untreated Natural Sindanyo
PERIOD OF EXPOSURE TO 100% RELATIVE HUMIDITY AT 20° C (DAYS)

'Natural Sindanyo' is widely used as a non-inflammable insulant but is limited in many applications by its high moisture absorption. The improvement in the insulation resistance characteristic under high humidity is shown in the graph with the performance of a well established type of phenolic paper laminate included for comparison.

Silicone Resin Impregnated Sindanyo has excellent thermal endurance and arc resistance. Suggested applications include arc chutes, components for dry-type transformers and domestic heating appliances as a substitute for paper/phenolic board where flame resistance or high anti-tracking properties are required.

** Cement bonded asbestos board made by Turners Asbestos Co. Ltd.*

**MIDLAND SILICONES LIMITED**

PAGE 4

# Navy specifies silicone insulated cables

'The British Admiralty has decided to use silicone insulated cables for all ship wiring purposes in future H.M. Ships. Such cables will have a much longer life than the types now used in the more onerous operational conditions which will be experienced in future ships and will have fire resistant properties which should confer substantial operational advantages.' *Admiralty statement.*

Silastomer* silicone rubber insulated cables will give long term service at temperatures up to 200°C. They show excellent resistance to oxidation and the effects of corona. Even more important, in some applications is the fact that they can operate during and after fire since Silastomer leaves an insulating silica residue after decomposition.

Silastomer insulated wires and cables are used in aircraft wiring systems, ignition and electronic circuits, domestic and other electrical appliances and for general industrial wiring applications where high temperatures occur.

* *'Silastomer' is a registered trademark of Midland Silicones Ltd.*

*(Photograph by courtesy of Joseph Lucas Ltd.)*

# Every service engineer should keep a tube of MS 4 insulating compound in his kit

This grease-like material does not harden or melt over the temperature range −50°C to +200°C. It is anti-tracking, corona-resisting, chemically inert and highly water-repellent. It lubricates, protects and seals disconnectable plugs and sockets, cable harnesses, ignition circuits and terminals. It extends the life of cable covering and flexible bushes and grommets. When lightly smeared on insulators it maintains high insulation resistance under wet conditions.

# Technical service facilities

Silicones are used in all forms of electrical equipment as insulation, heat transfer media, lubricants, structural components or seals. Our Electrical Engineers and Technical Service Department are ready to help you in the choice of the silicone product best suited for your application.

For further information and names of suppliers who can offer you MS silicone insulating materials write to:

MS

**MIDLAND SILICONES LIMITED**

*(associated with Albright & Wilson Ltd. and Dow Corning Corporation)*

**MIDLAND SILICONES LTD**

68 KNIGHTSBRIDGE · LONDON · SW1

*Telephone: Knightsbridge 7801-9 Telegrams: Midsil Wesphone London*

**first** *in British Silicones*

AREA SALES OFFICES:

LONDON · BIRMINGHAM · GLASGOW · LEEDS · MANCHESTER

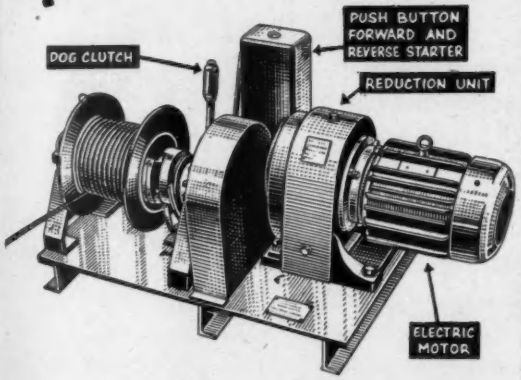
# Encapsulation and Suppression

## SIMS ELECTRONICS Ltd.

Complete
suppression circuits for
DOMESTIC APPLIANCE MANUFACTURERS.
Single units—no cross connections. Any shape to suit appliances—wire ends or terminals.

199, STREATHAM RD. MITCHAM TEL. MITCHAM 2558

# Thompson ELECTRIC WINCHES




*The 3-ton pull Electric Winch with a rope speed of 30 ft. per minute shown above is just one of many electrically powered winches which we have designed specially to meet the particular needs of a customer. Let us advise you on your hauling problem.*

Sole Manufacturers:
**THOMPSON BROS. (ENGINEERS) LTD.**
ARCHERY WORKS, ARCHERY ROAD, LONDON, S.E.9

# Can you say sturdy steel jacketed heater units for steady heating in shaky places six times, quickly?

It's a mouthful, but fortunately you only have to say it once—preceded, of course, by the name CRESSALL. CRESSALL Steel Jacketed Heater Units are made to the very highest possible standard and a very wide range is manufactured, adaptable, where possible, to individual requirements.

*Forty years' experience in design and manufacture is behind each* CRESSALL *Steel Jacketed Heater Unit, which has that extra margin of durability so necessary for withstanding the constant wear and hard usage in educational and industrial laboratories.*

*Write for Catalogue Section B, List 82.*

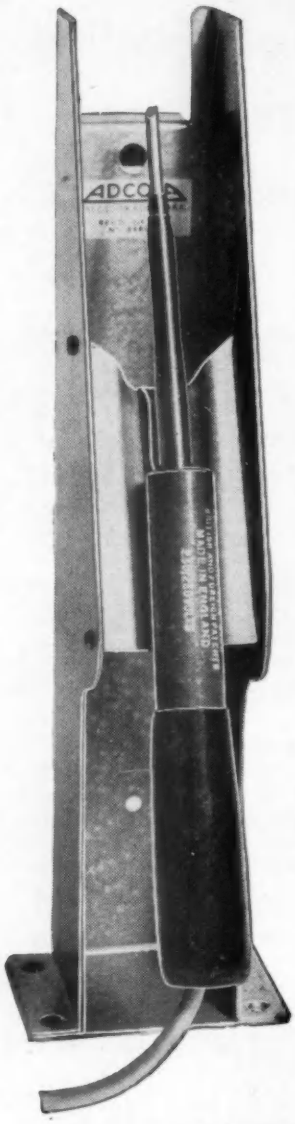
Cressall
THE CRESSALL MANUFACTURING COMPANY LIMITED
*(A subsidiary of The Expanded Metal Co. Ltd.)*
*A.I.D. & A.R.B. APPROVED*
ECLIPSE WORKS · TOWER STREET · BIRMINGHAM 19 · TEL: ASTON CROSS 2666
LONDON OFFICE: BURWOOD HOUSE · CAXTON STREET, S.W.1 · TEL: ABBEY 7766

ADCOLA
PRODUCTS LIMITED
(Regd. Trade Mark)

$\frac{1}{8}$" Bit Type. List 70
For Instrument and sub miniature work

$\frac{3}{16}$" Bit Type. List 64
For Factory and Bench Assembly, etc.

SOLDERING INSTRUMENTS
AND EQUIPMENT



Manufactured for all Voltages

PROTECTIVE SHIELDS. List 68
(as illustrated)

British, Canadian, American and Foreign
Patents, Registered Designs, etc.

REPRESENTED IN MOST COUNTRIES

*For Catalogues and Information apply Sole Proprietors and Manufacturers*

HEAD OFFICE SALES AND SERVICE

**ADCOLA PRODUCTS LTD.**
Gauden Road
Clapham High Street
London, S.W.4

*Telephones*
MACaulay 3101-4272

# short-handed?

Only *one* pair of hands is required to operate the Azoflex model 221 to produce prints in large quantity—dried, flat and ready for immediate trimming and collating. No darkroom, no elaborate ventilating system and ducting are necessary as there are no unpleasant fumes, and therefore AZOFLEX machines are completely mobile to facilitate reorganisation or expansion. Exposing, developing and print delivery are all synchronised for an even flow of finished work, and output in excess of 100 20″×30″ prints per hour can easily be achieved. AZOFLEX is the *only* daylight reflex copying process and it is the *only* photoprinting process to apply a measured dose of developer, thus ensuring optimum quality.

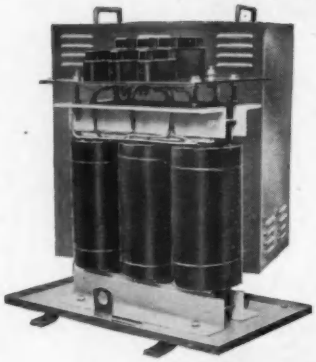
The majority of AZOFLEX photoprinting machines can, subject to certain conditions, be hired as an alternative to outright purchase, where this is preferred.

**AZOFLEX MODEL 221. Combined synchronised printer and developer. Capacity: cut sheets and rolls up to 42 in. wide. Printing speed: from 6 in. to 15½ ft. per minute. Dimensions: Height 52 in. Width 67½ in. Depth 52 in. with delivery tray extended. Weight: approximately 850 lbs.**

**ILFORD** *Azoflex*

**Enquiries to:**
**Ilford Limited**
**Industrial Sales Dept. AZ14F**
**Ilford, Essex**
**Telephone: Ilford 3000**

*MACHINES AND MATERIALS FOR DRAWING OFFICE PHOTOPRINTING*



Quality Transformers for all purposes in silicon steel, grain oriented steel, "C" cores, "E" cores, "Y" cores to BRITISH STANDARDS SPECIFICATIONS — Chokes — Reactors

ETC

## AIR COOLED

# TRANSFORMERS

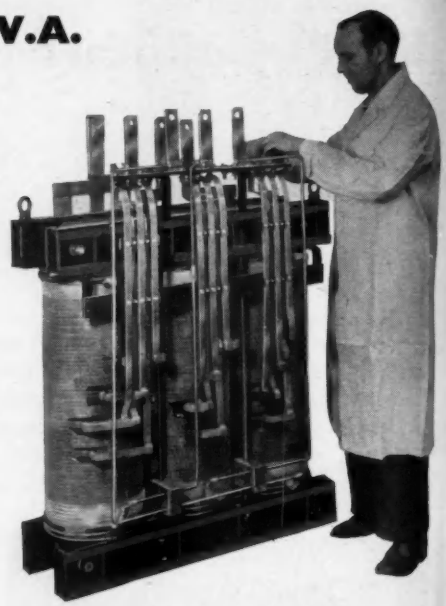
## UP TO 500 K.V.A.

Oil Cooled Transformers up to 500 K.V.A. 33 K.V.

Prototype and development work

Repairs to all types of transformers up to 500 K.V.A.

Speedy delivery



*Also Manufacturers of*

CONTROL PANELS
FUSEBOARDS
AC/DC UNITS
POWER PACKS
DISTRIBUTION BOARDS
FOR SPECIAL PURPOSES
LOW VOLTAGE TRANSFORMERS FOR HAND-TOOLS AND LIGHTING

Approved by C.E.G.B. On Post Office and Ministry of Supply Lists.

**EXPRESS**

**TRANSFORMERS & CONTROLS LTD.**

**44-46 Beddington Lane, CROYDON, Surrey**

*Telephone : Thornton Heath 2443-4*

You can count on Brook service . . . from the Brook Motor Corporation in Chicago, covering the entire United States and Central America, to the more remote outposts of Central Africa or Burma.

Not only are Brook electric motors well known and used but spares and service are always near at hand.

See STAND 1428

BROOK MOTORS Ltd
HUDDERSFIELD • ENGLAND

CHICAGO • U.S.A.
BROOK MOTOR CORPORATION

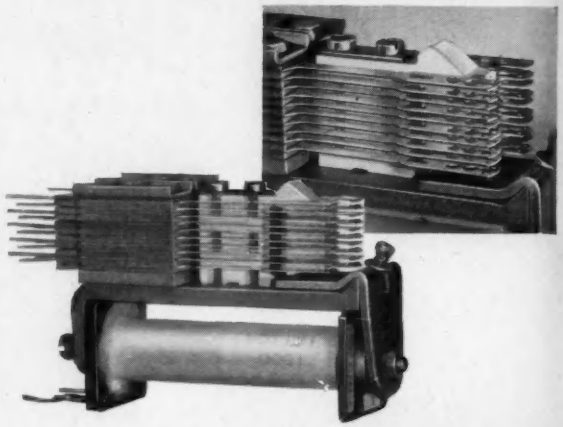
58/5

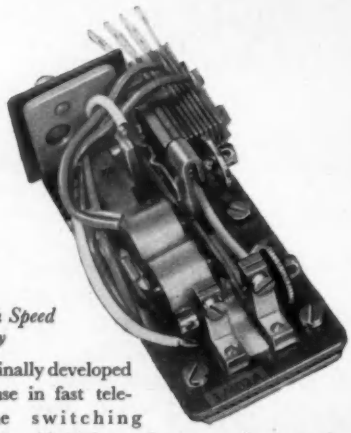
# 3 outstanding RELAYS

These relays are available for early delivery; your enquiries are welcomed

*Comb Relay*

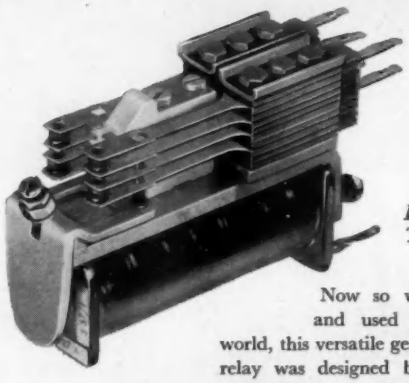
This is our latest development in relays and will give 100 million operations without the need for readjustment. Long life and reliability have led to its adoption by the British Post Office for use where continuous pulsing is required. A wide range of contact combinations is available with a maximum of 10 make or 10 break actions. It is suitable for switching light currents at 250 v.





*High Speed Relay*

Originally developed for use in fast telephone switching circuits, this high speed relay is of great value in automation systems. It can effect a single changeover action in as little as 1.5 milliseconds. A high speed relay is also available with two changeover actions.



*B.P.O. 3000 Type*

Now so widely known and used all over the world, this versatile general purpose relay was designed by us in the early thirties for the British Post Office. Many millions are now in use in both telephone and industrial applications. It is available in an extremely wide range of coil resistances and spring set combinations for practically all normal voltages and frequencies.

SIEMENS EDISWAN

**SIEMENS EDISON SWAN LTD**
*An A.E.I. Company*
Woolwich, London, SE18
*Telephone: Woolwich 2020 Extn. 621*

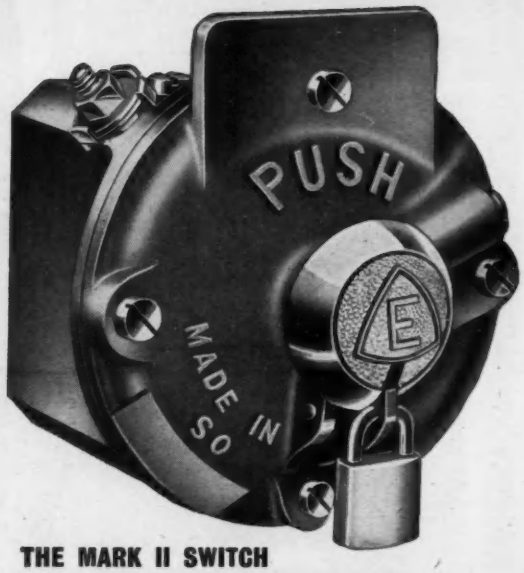
# Ellison Emergency Trip Switches

## for dependability and versatility

An Ellison Emergency Push Switch can be relied upon to operate with certainty and with ease—whether it be used as a simple means of cutting off power to machinery in accordance with the Factory Act, for a siren, or to perform any of the other varied forms of service for which it is suitable.

Available for wall or panel mounting and for group mounting up to 4 way; for hand or foot operation and for hand or self resetting. Suitable for voltages of up to 660. Rated at 5 amps. continuously.

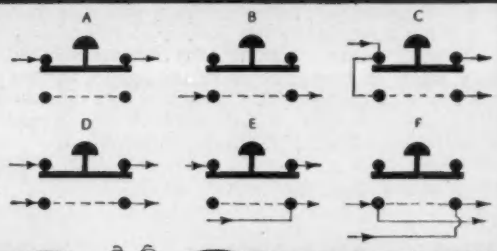
Write for List No. 11 for details of "Ellison" trip switches and tappet operated limit switches for up to 150 amps.




### THE MARK II SWITCH

The contacts provide two single-pole, double-break switches that can be used for independent circuits or linked to give a single-pole, two-way combination. The diagrams below show alternative methods of wiring as follows:—

A. Normally "closed".
B. Normally "open".
C. Single-pole, two way, which may be used for a ringing key.
D. Two independent switches, one normally "closed" and one normally "open". Also may be used for a ringing key.
E. Normally "closed" with loop terminals as for series connected under-voltage release circuits.
F. Normally "open" with loop terminals as for parallel-connected shunt trip circuits.




YOU CAN RELY ON AN ELLISON PRODUCT

GEORGE ELLISON LIMITED BIRMINGHAM ENGLAND

757/G92

# IN CONDITIONS LIKE THESE...

N

W E

S

**THE LIFE OF ROTATING ELECTRICAL MACHINERY DEPENDS ON THE QUALITY OF THE INSULATING VARNISH**

All grades of Sterling electrical insulating varnishes are individually blended to suit the varying conditions under which motors operate in many different parts of the world where so much depends on the varnish. Sterling chemists have to consider — and combat — such diverse factors as extremely high or low temperatures, tropical service, presence of abrasives, alkalis, acids, etc.

*Write for details — we shall be pleased to advise you without obligation.*

MADE BY CHEMISTS

Sterling

INSULATING VARNISHES

SERVICED BY ENGINEERS

**SPECIALISTS IN INSULATION**

**THE STERLING VARNISH CO. LTD. FRASER RD. TRAFFORD PARK MANCHESTER 17**

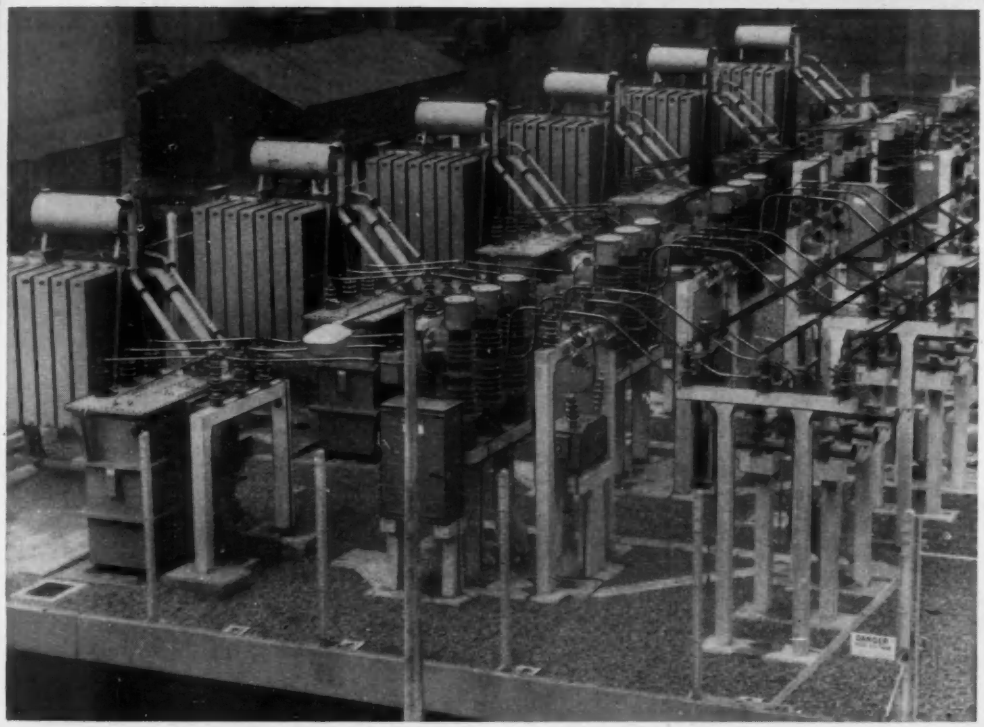
*Telephone: TRAfford Park 0282 (4 lines)* *Telegrams: "DIELECTRIC MANCHESTER"*

London Office & Warehouse: 6 LONDON ROAD, BRENTFORD, MIDDLESEX. Telephone Ealing 9152

dm 579

# FERRANTI TRANSFORMERS for ROLLS-ROYCE DERBY

Six 15 MVA 33/11 kV 3 Phase 50 cycles 'ON' Ferranti Transformers have been installed at Rolls-Royce Limited, Derby for the purpose of supplying power to the Aero Engine High Altitude Test Facility (Consulting Engineers, McLellan & Partners in association with Merz and McLellan).



*A view of the installation at Rolls-Royce Limited, Sinfin, Derby.*

*Specify* **FERRANTI** *transformers famous throughout the world*

FERRANTI LTD · HOLLINWOOD · LANCS Telephone: FAIlsworth 2000
London Office: KERN HOUSE, 36 KINGSWAY, W.C.2. Telephone: TEMple Bar 6666

F1219/2

**If you want extra-long service . . .**
**get cable jacketed with**

# DU PONT NEOPRENE

Many power companies all over the world have been using for years cable jacketed with Du Pont neoprene. They have found that Du Pont's neoprene gives jackets high dependability and long life. That's because neoprene has inherent resistance to all the usual causes of deterioration . . .

SUNLIGHT AND WEATHERING
FLEX-CRACKING AND HEAT
FLAME AND OZONE
ABRASION, CUTTING AND CHIPPING
OILS, GREASES AND SOLVENTS

Get long service with a minimum of maintenance expense. You can cut your costs by specifying cable jacketed with Du Pont neoprene.

Your local distributor will be glad to give you further information about products made with Du Pont neoprene. New ways in which neoprene products can effect savings for you are contained in every issue of THE DU PONT ELASTOMERS NOTEBOOK. We will be glad to put you on the mailing list if you will fill out and mail us this coupon.

*For more information about locally manufactured products made of Du Pont neoprene, write:*

**Distributors DUPONT COMPANY (UNITED KINGDOM) LTD., 76 JERMYN STREET, LONDON, S.W.1**

**Sales Agents DURHAM RAW MATERIALS LTD., 131 GREAT TOWER STREET, LONDON, E.C.3**

DU PONT
REG. U.S. PAT. OFF.

# NEOPRENE

*Better Things for Better Living . . .*
*through Chemistry*

E.I. du Pont de Nemours & Co. (Inc.)
Room D-2068-X Du Pont Building,
Wilmington 98, Delaware, U.S.A.

NAME.....

POSITION.....

COMPANY.....

ADDRESS.....

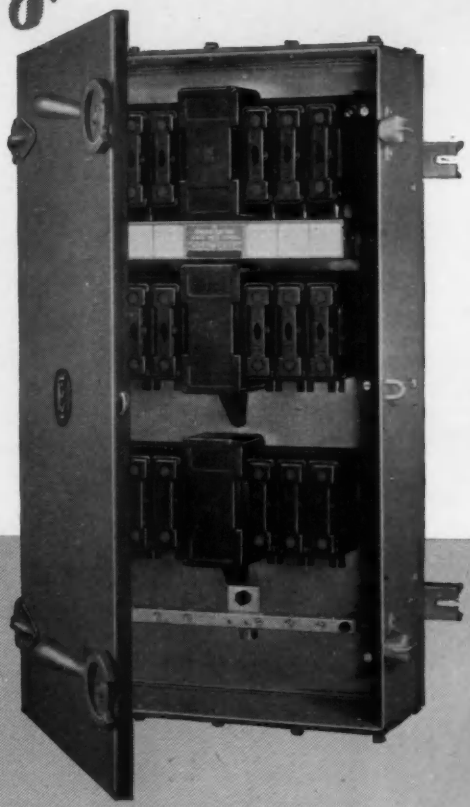
CITY.....COUNTRY.....

# RED SPOT

## Heavy Duty FUSEBOARDS

**500 volts:**
**15, 30, 60 and 100 amps**

The unique safety features incorporated in "Red Spot" fuseboards are now available in a new range with exceptionally robust, all-welded, heavy gauge, sheet steel dust-protecting cases, resistant to oxidisation and corrosion.



*Full details are given in publication FG/138*

HAVE YOU RECEIVED YOUR COPY? *If not write to:*

The ENGLISH ELECTRIC Company Limited, Fusegear Division, East Lancashire Road, Liverpool, 10.

# 'ENGLISH ELECTRIC'

**fusegear**

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

FG.30C8 WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

Modern Production Methods require electrical power to be brought close to hand. An E.M.S. system will do it with safety, economy and an almost endless flexibility of application.

*Bringing*

***POWER***

*within easy reach*

**Exactly where and when it's needed**

Whether it's a case of power keeping pace in complete safety with mobile equipment like cranes hoists or conveyors, or a need to have power 'on the spot' where large numbers of small electrical appliances have to be rapidly connected, it's a job for E.M.S.

MODIFICATIONS AND SPECIALS TO CUSTOMER'S REQUIREMENTS.

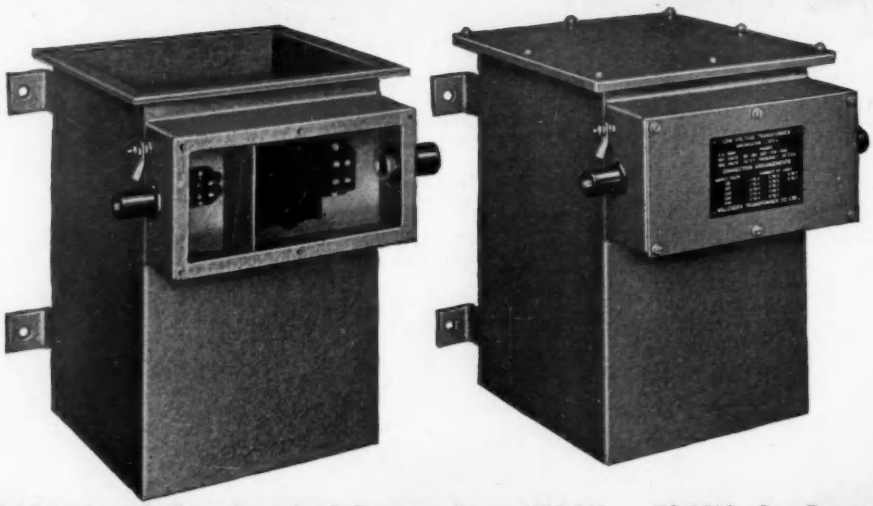
EMS ELECTRICAL PRODUCTS LTD.

COMMON LANE KENILWORTH
WARWICKSHIRE . ENGLAND · Tel. KENILWORTH 658

Manufacturers of **E**fficient **M**obile **S**afe distribution systems

**WILLESDEN**
TRANSFORMER COMPANY LTD.

*Low Voltage Transformers*
**for**
*Portable Electric Lamps*
**and**
*Portable Electric Tools*



*Full Details of Our Standard Ranges from 500 VA — 50 kVA On Request*

MANOR PARK WORKS, MANOR PARK ROAD, LONDON, N.W.10 Elgar 5445-6

# the power of paper

Famous papers for printing . . . paper for industry and commerce . . . paper for insulating telephone and power cables . . . paper for photography . . . technical papers for plastics and for the electrical industries . . . TULLIS RUSSELL make them all —to the highest standard of quality, consistency and reliability, that has now come to be expected of papers bearing the Tullis Russell emblem.

**Tullis Russell & Co. Ltd.**

PAPERMAKERS SINCE 1809

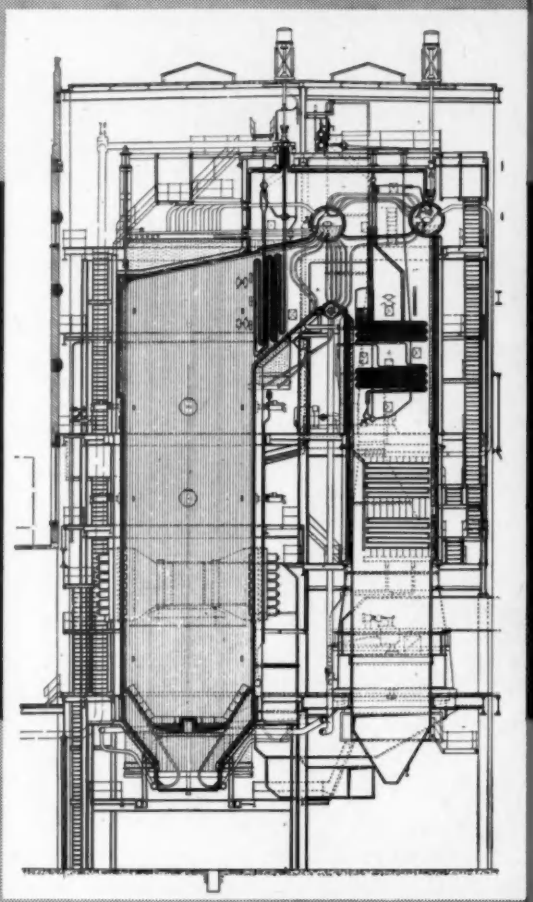
SCOTLAND
AUCHMUTY & ROTHES PAPER MILLS
MARKINCH FIFE

LONDON
IVYBRIDGE HOUSE
UPPER THAMES STREET E.C.4

BIRMINGHAM
GEORGE HOUSE 164/5 LUDGATE HILL

MANCHESTER
111 CORN EXCHANGE BUILDINGS
CORPORATION STREET

# IC oil fired boilers at South Denes power station



The two International Combustion boilers at South Denes Power Station have an evaporation of 550,000 lb/hr. at M.C.R. with steam at 950 p.s.i.g. and 910°F.
International Combustion Limited boilers are installed in power stations and industry throughout the world, meeting a wide range of terminal conditions with all types of firing—pulverised fuel, oil, stoker and mixed firing.

**IC INTERNATIONAL COMBUSTION LIMITED**

NINETEEN WOBURN PLACE, LONDON, W.C.1. Telephone: TERminus 2833
WORKS: DERBY

*MEMBER OF ATOMIC POWER CONSTRUCTIONS LIMITED · ONE OF THE FIVE BRITISH NUCLEAR ENERGY GROUPS*

YGA 5279

# BEFORE YOU CAN SAY NICHROME*

We have strong grounds for claiming our resistance wire-drawing plant at Cheadle the most modern in existence. Yet even with the latest machinery and production methods quite a number of operations are carried out by hand. Which might seem odd with a finished product apparently so simple and straightforward. The reason is that a great part of the secret of making Nichrome*, which is recognised as the world's standard of quality for electrical resistance wire, lies in the special skills used at every stage of the process. They are skills born of experience and the belief that anything less than perfection is not acceptable. We label the material Nichrome* only when we are satisfied that it is completely matched to specification.

**NICHROME* V** Temperatures up to 1150°C (2102°F) for resistor elements in industrial and domestic appliances

**NICHROME*** Temperatures up to 950°C (1742°F) for domestic and similar appliances in the medium temperature range

*Write for Data Sheet No. 5, a 24-page handbook giving data and specifications for the Nichrome* alloys*

**BRITISH DRIVER-HARRIS CO LTD**

CHEADLE HEATH, CHESHIRE

1908-1958 50 years

GOLDEN JUBILEE 1958

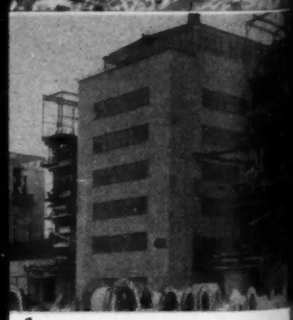
* REGISTERED TRADE MARK

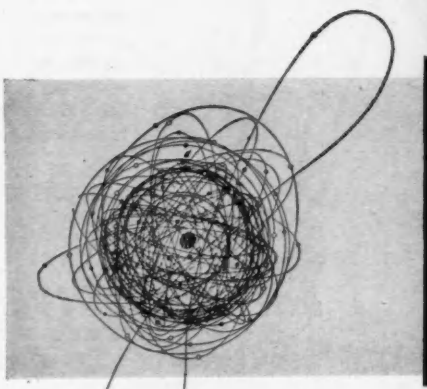
TODAY'S CABLES FOR TOMORROW'S PO

# Britain's future takes shape

Already Britain's great new Atomic Power Station—for the cabling of which Henleys were awarded the £½ million contract—takes impressive shape at Chapelcross, Dumfriesshire.

In step with the vast building project, Henley cables* are being installed in Reactor buildings, Turbine Hall, Substations and other associated works as the civil work proceeds. Cabling for the first Reactor is now complete and for Reactors 2 and 3 is well in hand.





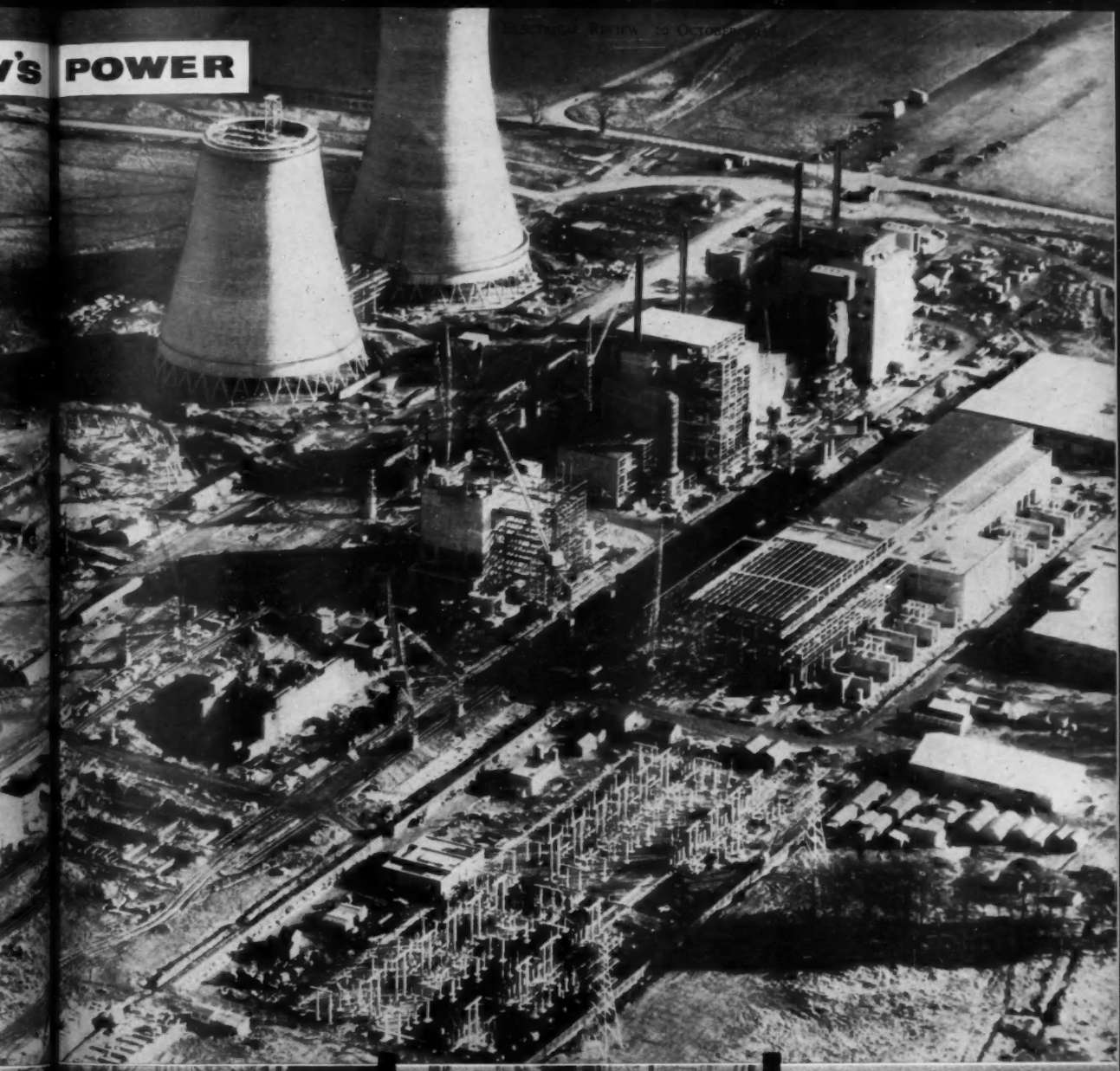
* Over 125 miles of Henley cables will eventually be used on this project, including H.T. and L.T. Paper Insulated F.I.N.D. type cables, V.R. cables and Mineral Insulated cables. The Contract is scheduled for completion by September, 1959.

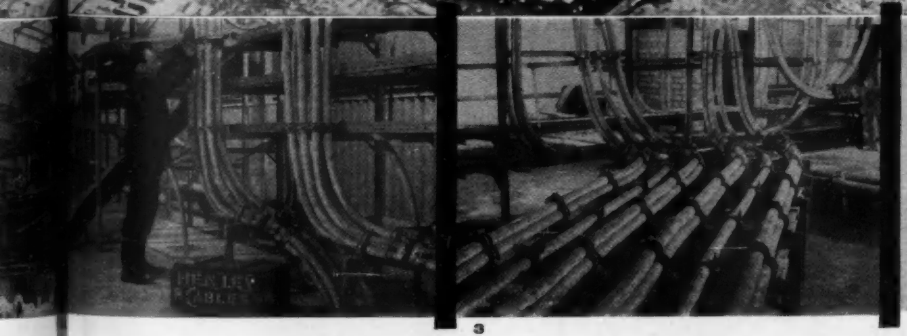
*Main Contractors:* MITCHELL CONSTRUCTION CO.
*Consultants:* MERZ & McLELLAN
32 VICTORIA STREET, LONDON, S.W.1

Let HENLEY cable ca

W. T. HENLEY'S TELEGR ORKS CO

's POWER





**AERIAL VIEW OF SITE**
*Aerial view showing progress at Chapelcross. In the picture are cooling towers, reactors, turbine hall and administration buildings.*

**1. REACTOR BUILDING**
*General view of REACTOR building.*

**2. TURBINE HALL**
*Cable installation in Turbine Hall Cable Annexe.*

**3. REACTOR BUILDING No. 1**
*General view of the cable installation in the basement.*

*Aerial photograph by permission of Mitchell Construction Company*

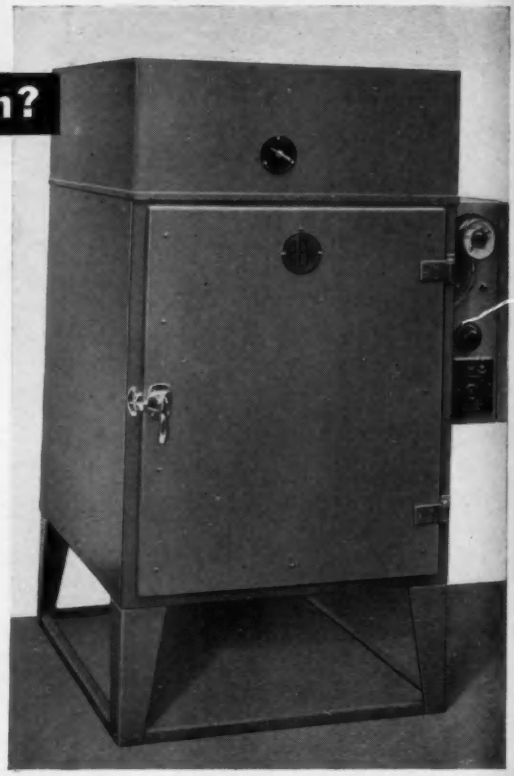
ecarry the current

ELEGRAPH WORKS COMPANY LIMITED · 51-53 HATTON GARDEN · LONDON · E.C.1 · CHANCERY 6822

## Have you a heating problem?

***You should consult A.E.W. Specialist Manufacturers of industrial ovens for all heat treatment processes***

Perhaps you've a new product that calls for something special in the way of heat treatment, or, maybe you wish to modernise or extend your existing plant? Whatever your problem, A.E.W. can supply the answer—and, if need be, design and build an oven to meet your specific requirements. Made in an elastic range of sizes, A.E.W. Ovens have automatic temperature control and controlled air circulation. Shelves and other accessories are fitted to clients' requirements. Please write us for fully descriptive brochure.



**A.E.W. LTD.**

IMPERIAL WORKS EDGWARE MIDDLESEX
TEL: EDGWARE 5278

---

# Flawless

No, we shall not be silly and claim that our castings are as flawless as a piece of 16th century Venetian Glass. But we can go this far: we can say that just as the old master craftsmen got great satisfaction out of doing a job as well as it could possibly be done, so do we. That is why so many customers whose castings must have a fine skin which will readily anodise put their trust in Great Bridge Foundries

**PRECISION CASTINGS IN ALUMINIUM, GUN METAL, GREY IRON, ETC. TO ALL SPECIFICATIONS**

Phos. bronze and gun metal solid and cored sticks always in stock

**THE GREAT BRIDGE FOUNDRY CO. LTD.**

Sheepwash Lane Great Bridge · Tipton
Staffordshire Telephone TIPton 1540 and 1361

*A MEMBER OF THE TRIPLEX FOUNDRIES GROUP*

THE SIGN OF A GOOD CASTING

# IN ALL THE BEST SPACESHIPS SATELLITES AND ROCKETS

TURRET TYPE

## PHILIDAS SELF-LOCKING NUTS WILL BE USED

INDUSTRIAL TYPE

Potential conquerors of space take no risks in fitting Philidas self-locking nuts. Their ingenious opposing torque cross-cuts feature sets up a tension that only a spanner can release. Vibration, heat changes and oil infiltration leave Philidas nuts completely unmoved—and they can be used again and again. Range includes standard and thin industrial and turret nuts, turret wheel nuts, single and double anchor nuts.

THEY YIELD ONLY TO A SPANNER

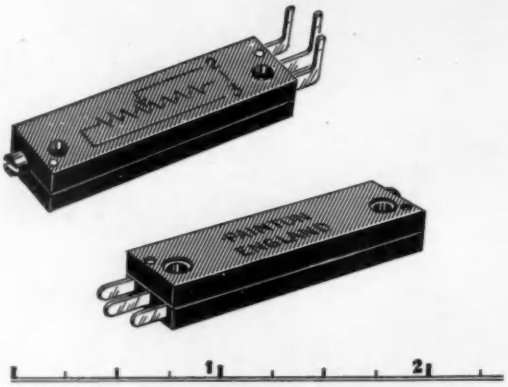
*Send for our new catalogue*

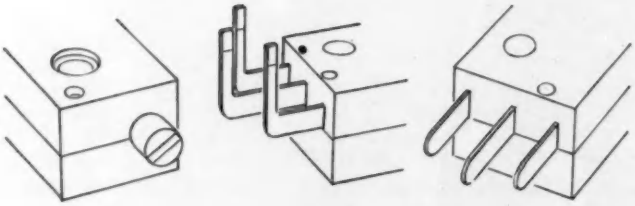
**PHILIDAS DIVISION—WHITEHOUSE INDUSTRIES LTD**

FERRYBRIDGE, KNOTTINGLEY, YORKS. *Tel: Knottingley 2323 (5 lines) Telex 55-16*
London office: 44 Hertford Street, W.1. *Tel: LEGation 3088. Telex 23549*
Northampton Office and Stockroom Countess Road, Northampton
*Phone 3766. Telex 31624*

# THE NEW 'FLATPOT' POTENTIOMETER

**This most recent addition to the comprehensive range of Painton potentiometers provides the electronic industry with a robust subminiature component that has been developed primarily for use with printed circuits, although its general design makes it eminently suitable for a wide range of applications; it is particularly useful where conditions of vibration pose problems for the design engineer. Its unusual 'linear' construction simplifies mounting and stacking where chassis space is at a premium.**





The potentiometer winding, slider and drive are totally enclosed by a nylon filled plastic housing.

The slider is driven by a lead screw, whose head projects from the housing, permitting fine adjustment and resulting in stable settings.

The unique construction ensures rigidity and strength and minimises the likelihood of oxidation of the contact surfaces.

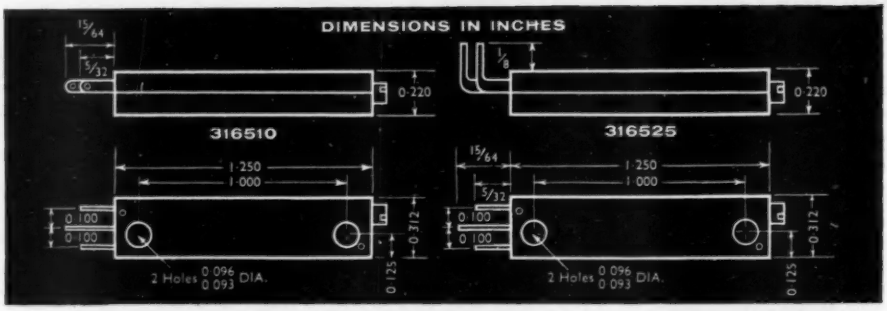
Damage to the mechanism by overwinding is obviated by a slipping nut device.

Straight or 90° terminals are available.

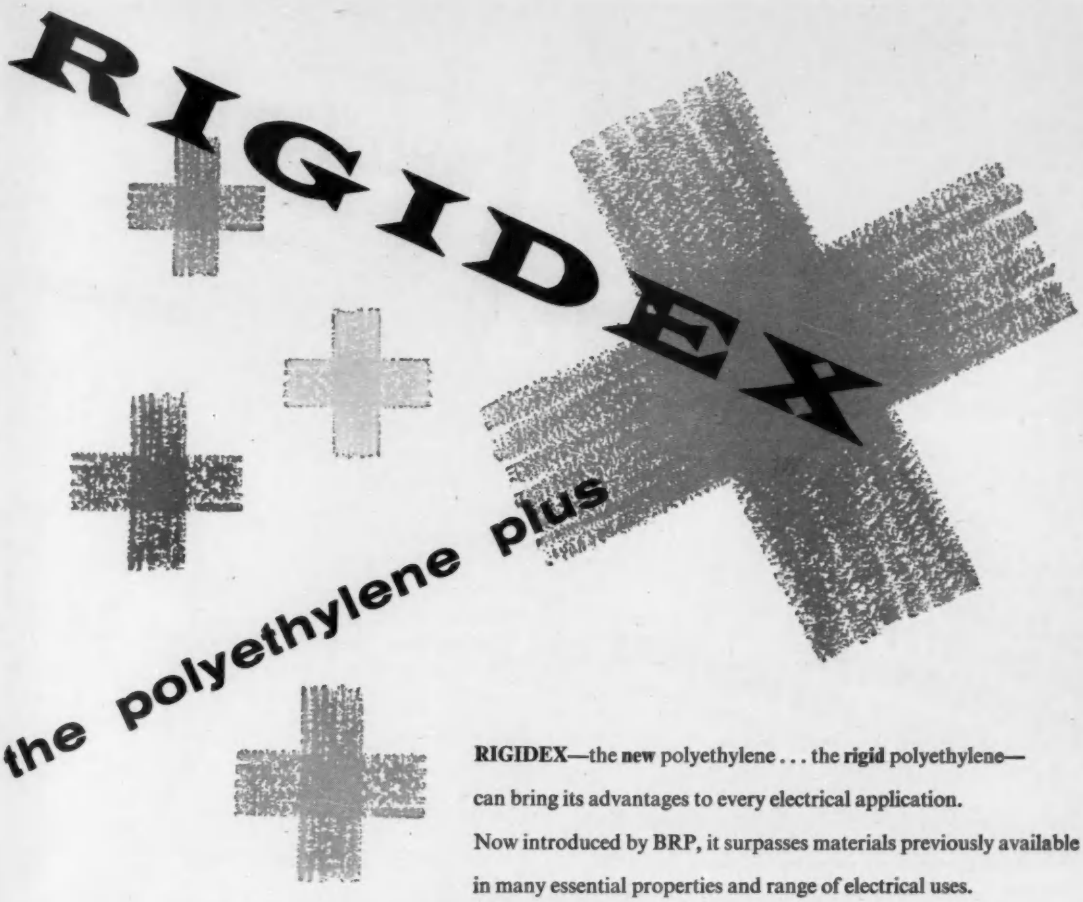
Gaps between terminals and distance between the two locating holes conform to the 0.1 inch module common in printed circuit boards.

**Range:** 10 Ω to 10K Ω
**Tolerance:** 10%
**Power Rating:** 1 watt at 20°C ambient
**No. of turns from Zero to maximum resistance:** 25
**Insulation Resistance:** in Excess of 1000M Ω
**Weight:** 0.1 oz. (approx.)

**Write for technical leaflet**




**Painton & Co. Ltd.**
KINGSTHORPE NORTHAMPTON
Tel: 32354-5-6 Telegrams: 'Ceil, Northampton'




**RIGIDEX**—the **new** polyethylene . . . the **rigid** polyethylene—can bring its advantages to every electrical application.

Now introduced by BRP, it surpasses materials previously available in many essential properties and range of electrical uses.

**RIGIDEX is stronger, tougher, more rigid.** Makes products lighter, unbreakable and resistant to abrasion. Thinner coatings are possible on wire and cable without loss of insulating properties.

**RIGIDEX has higher softening temperature.** Does not melt in boiling water. Immune from attack by oils, acids, alkalis and gases. Improved stability to U.V.

**RIGIDEX looks cleaner, feels fresher.** Mouldings possess exceptional surface finish . . . can be made in wide range of colours . . . are pleasant to the touch.

Write for Booklet 316 giving information about **RIGIDEX**

**RIGIDEX** is made by a process developed by the Phillips Petroleum Company who have licensed the manufacturing rights to **British Hydrocarbon Chemicals Ltd.**

BRP

RIGIDEX

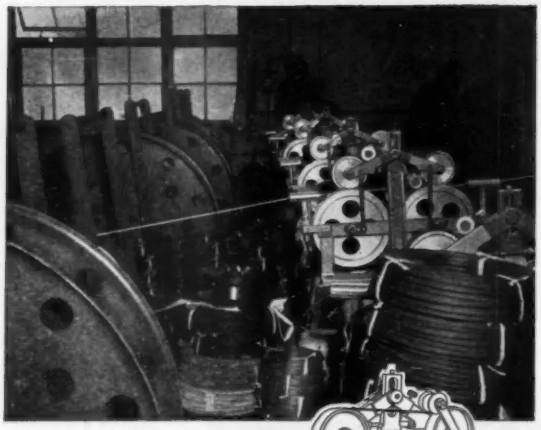
Regd. Trade Mark

Sole Selling Agents

## BRITISH RESIN PRODUCTS LTD

A Member of the Distillers Plastics Group

SALES & TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDE PARK 0151



THIS MACHINE CAN SAVE YOU UP TO 1% OF YOUR TURNOVER IN CABLE MANUFACTURE

## *The* BARNABY *Cable Measurer*

For consistent accuracy experienced users install the Barnaby Cable Measurer, made in two sizes up to 1 in. and 2½ in.

This equipment is far in advance of previous methods and can save its cost in a few weeks.

Slip is reduced to an absolute minimum, cable drag eliminated and the equipment is capable of consistent measurement within the limit of plus or minus one quarter of one per cent at high operating speed.

## *These features mean* accurate *readings*

TWIN BELTS ensure that the cable is measured over a length and is not dependent upon a point contact.

NEGLIGIBLE SLIP is guaranteed by the pivoted top belt.

SUBSTANTIAL GUIDES ensure even run of cable. The guides are quickly interchangeable for different sizes up to 1 in. or 2½ in.

EASY RUNNING through light alloy wheels and ball bearing mounting. Minimum drag on cable.

SPECIAL COUNTER measuring to 3 in. increments.

SELF-ADJUSTING.

CATMUR CABLE MACHINERY AND EQUIPMENT
Division of Catmur Machine Tool Corporation Ltd.

103 LANCASTER ROAD, LADBROKE GROVE
LONDON, W.11
Telephone: PARk 9451-2

NRP

WHICH is WHICH?
You KNOW, but do your customers know?

To follow the "Safety First" recommendation, make sure your electrical leads, whether to Domestic Appliances or to Machine Tools, etc., are clearly defined. "Viskrings" simply slipped over the core-wires and/or the outer casing of the leads do the job and put an end to confusion or doubt.

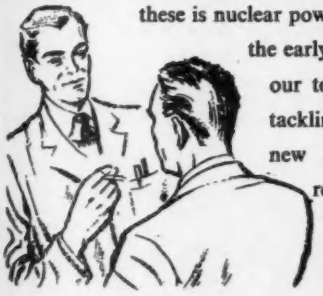
- NO TOOLS REQUIRED
- NO RUBBER USED
- IMPERVIOUS TO OIL AND PETROL
- INDELIBLY PRINTED
- SUPPLIED IN ALL COLOURS AS WELL AS WHITE
- SELF-FIXING
- DO NOT INCREASE DIAMETER OF LEAD

"VISKRINGS"
for PERMANENT IDENTIFICATION OF ELECTRIC LEADS

VISCOSE DEVELOPMENT CO. LTD.
40 CHANCERY LANE, LONDON, W.C.2
CHANCERY 8111

*Have Ransome and Marles been associated with any of the big developments in British industry?*

We don't hit the headlines — but we often help to make headline news possible. Since the war we have carried out research into design, materials, lubrication and production for a number of important projects. One of these is nuclear power generation. From the early days of Calder Hall our technicians have been tackling fresh problems as new and more powerful reactors are designed.



*Are there any other interesting projects?*

Yes, several. Britain has been achieving a world-wide success with her aircraft engines. Two notable users of R&M Bearings are Armstrong-Siddeley Motors and Bristol Aero Engines. The Proteus engines of the latest Bristol Britannia are of course fitted with R&M Bearings.

Then again "automation" is a popular word these days. We at R&M are becoming increasingly "automatic" in many of our processes in shops and offices. We also supply the bearings for the latest electronic machines. Our customers include Powers Samas, Elliott Brothers, IBM and British Tabulating Machines — just another example of the role played by R&M in all fields of industrial development.

BALL & ROLLER R&M BEARINGS

RANSOME & MARLES BEARING CO LTD • NEWARK-ON-TRENT • ENGLAND

TELEPHONE · NEWARK 456 AND TELEX 37-306

CONSULTING ENGINEERS: KENNEDY & DONKIN

**The first 11-kV equipment incorporating an air-break circuit-breaker has been ASTA tested for a rating of 500 MVA.**

**A number of these equipments have been installed in the North of Scotland Hydro-Electric Board's St. Fillans power-station.**

11-kV
500-MVA
AIR-BREAK
SWITCHGEAR

**Reyrolle**

A. REYROLLE & COMPANY LIMITED HEBBURN · COUNTY DURHAM · ENGLAND

# The 'SUN' rises on a new era of service

SUNCO
Trade Mark

*The new Trade Counter designed for speedier service.*

*The new Lighting Fitting Showrooms for your—and your clients'—use.*

**This new building with greatly improved facilities represents another step forward in the "Sunco" tradition of unsurpassed service to the electrical Contractor and Retailer.**

**Our completely rebuilt showrooms will be open from September 29th to exhibit the latest Appliances and Heaters, Lighting Fittings and Industrial Electrical Equipment.**

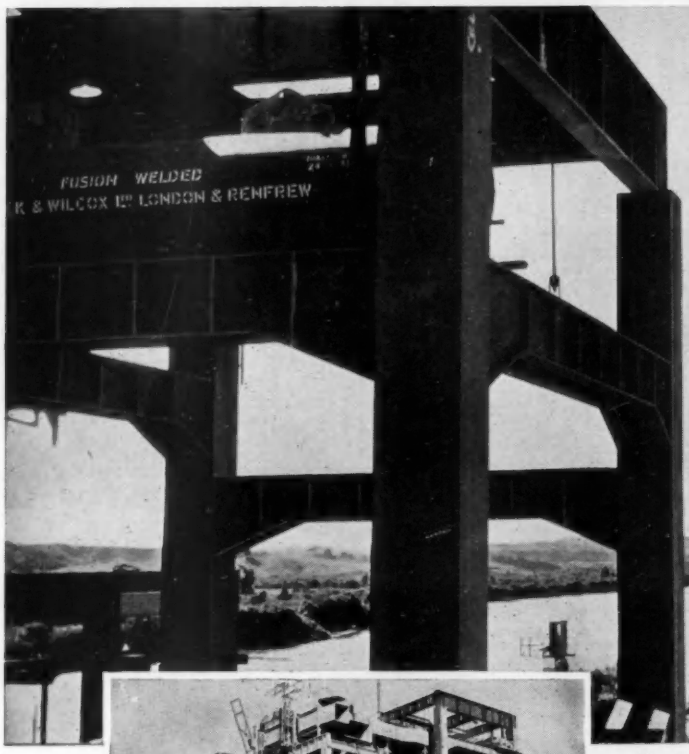
## THE SUN ELECTRICAL CO. LTD.

**118-120 CHARING CROSS ROAD, LONDON, W.C.2**

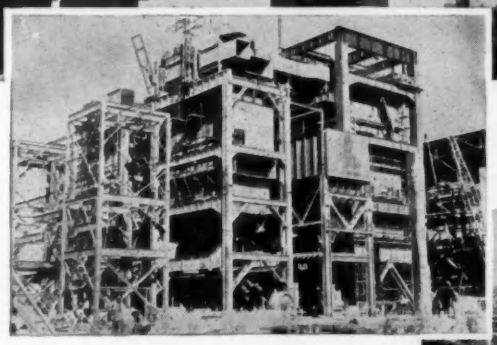
**Telephone: TEMple Bar 3500 (18 lines)**

*Branches at*
LEEDS, NEWCASTLE-ON-TYNE,
GUILDFORD, SLOUGH, WEMBLEY

D




# THERMAL POWER *for* NEW ZEALAND



*Above and left: Boiler plant during erection at the Mercer power station.*

*Below: Aerial view of the site on the Waikato river. Fuel will be supplied from the nearby Maramarua coalfield.*

**In a country where the main source of power is hydro-electric, New Zealand's largest steam power station, now approaching completion near Mercer in the North Island, for the New Zealand Government, is of particular interest.**

**Being built in one continuous operation, for a capacity of 180 MW, divided between six 30 MW generators, the station is equipped with six Babcock pulverized-fuel-fired Radiant boilers each to supply 300,000 lb./hr. at 635 lb./sq. in., 865°F., in a "semi-outdoor" type installation.**

**Babcock supplies, in addition to the entire boiler plant, include E-type coal-pulverizing mills, pipework, and the coal, ash and dust-handling plant.**

*Consulting Engineers: Preece Cardew & Rider.*

# BABCOCK

## STEAM-RAISING PLANT

**BABCOCK & WILCOX LIMITED, BABCOCK HOUSE, 209 EUSTON ROAD, LONDON N.W.1**

FRIDAY
10 OCTOBER
1958

# ELECTRICAL REVIEW

*Managing Editor:* HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

## In This Issue

**Developments in Generation** 639
An important point made in the 1957–58 annual report on electricity supply in England and Wales is that capital expenditure on plant commissioned or under construction during the year, at £50/kW, was the same as the average 1947 figure

**Aerial Cable** 641
To avoid tree felling in an area of outstanding beauty the South Western Electricity Board recently erected a h.v. plastic insulated aerial cable and in this article the design of the cable and the method of erection are described

**Phenomena in the Upper Atmosphere** 645
The author outlines the investigations being carried out during the International Geophysical Year into the electrical and magnetic phenomena in the ionosphere

**Electricity Tariff's Effect on a Sugar Refinery** 649
The effect of the electricity tariff on the power supplies to a sugar refinery is discussed. The author concludes that it is more economical to waste steam than to purchase electricity from the supply authorities

**Area Boards' Operations** 664
Tables published last week gave the principal trading results for 1957–58. In this issue some of the interesting points in the Boards' individual reports are reviewed

**Aero-Engine Testing** 673
The new aero-engine testing plant of Rolls-Royce, Ltd., was recently opened by the Prime Minister. The plant is capable of testing turbo-jet and turbo-prop engines under high altitude conditions

**Electrical Manufacture in Australia** 675
Industrial development in Australia since the war has been on an impressive scale, and there is confidence that the present high level of activity will continue. The manufacture of selected electrical goods is surveyed

✧ ✧ ✧ ✧

**Telephone Installation and Maintenance** 644
**Views on the News** 651
**I.E.E. Sub-Centre Chairmen** 652
**Personal and Social** 653
**Letters to the Editor** 656
**Industrial News** 657
**Modern Lighting Practice** 662
**Television Tube Manufacture** 667
**Power Factor Correction** 669
**System Simulation** 670
**Argentina's Need of Power** 671
**Photo-Electric Controls** 677
**New Electrical Equipment** 678
**Financial Section** 680
**Generation and Development** 683
**New Patents** 684
**Next Week's Events** 685
**Contract Information** 686
*CLASSIFIED ADVERTISEMENTS* 117
*INDEX TO ADVERTISERS* 128

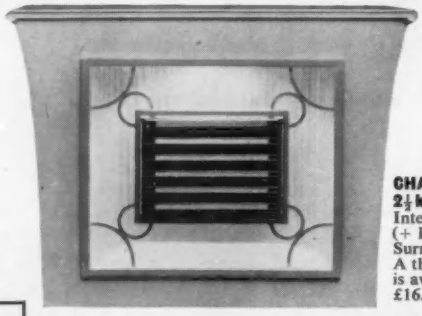
VOLUME 163 NUMBER 15 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home £4 15s 0d; Overseas £5 15s 0d; U.S.A. and Canada $16.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

# THE Chameleon .... outstanding model of Berry's 'new 9'

Today almost everyone is interested in interior planning and decoration. Your customers are design-conscious, and they will be fascinated by the luxurious new Chameleon. Its 'Paravec' heating elements are set against a background of slowly changing colours, each of which can be held indefinitely at the touch of a switch. There are two different Chameleon interiors; they can be fitted straight on to the wall if space permits, or used with any of the three surrounds.

**CHAMELEON 490, 2½ kW A.C. only.**
Interior: £27. 15. 1 (+ P.T. £6. 9. 11).
Surround: £23. 19. 0.



**CHAMELEON 491, 2½ kW A.C. only.**
Interior: £27. 15. 1 (+ P.T. £6. 9. 11).
Surround: £19. 5. 0.
A third surround is available at £16. 12. 0.

*Other new models are :*

**AURABERRY 2 kW A.C. only.**
'Paravec' heating which blends heating and firelight. £14. 17. 3 (+ P.T. £3. 5. 3).

**CHARMBERRY 2 kW A.C. only.**
Brilliant new Magicoal at a really competitive price. £10. 19. 5 (+ P.T. £2. 8. 1). Also 3 kW A.C. only. £12. 9. 8 (+ P.T. £2. 14. 10).

**WELLBERRY 2 kW A.C. only.**
Fits any normal well-grate fireplace, coal or log. £10. 0. 1 (+ P.T. £2. 3. 11).

**STUDIO 2 kW A.C. only.**
A portable radiator in contemporary styling. £4. 9. 9 (+ P.T. £0. 19. 9).

**SOLANO FAN HEATER 2 kW A.C. only.**
Warm air flows from illuminated louvres. £9. 14. 9 (+ P.T. £2. 2. 9).

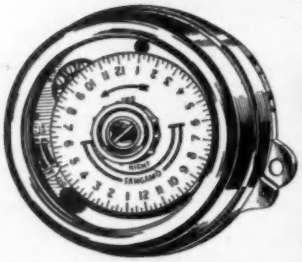
**SILHOUETTE 2½ kW A.C. only.**
Illuminated radiator with new 'Paravec' heating. £13. 5. 4 (+ P.T. £2. 18. 2).

**'WARM-WELCOME' A.C. only.**
A time switch for the mass market. 59/6.

Berry's

**BERRY'S ELECTRIC MAGICOAL LTD.**
Touchbutton House, Newman Street, London, W.1
Telephone : MUSeum 6800

---



**SANGAMO TIME SWITCHES**

The superiority of Sangamo Time Switches, both in design and performance, has been established over more than twenty years of intensive world service. In addition to 24 hour-dial switches, Solar Dial, Short Interval and Change-over types are also available. Advice and particulars of the entire range of Sangamo synchronous Time Switches will gladly be supplied on application.

SINGLE PHASE AND POLYPHASE WATT-HOUR METERS

SYNCHRONOUS TIME SWITCHES

SYNCHRONOUS MOTORS AND MOTOR UNITS

SANGAMO WESTON

PANEL & SWITCHBOARD INSTRUMENTS
*D.C. Moving Coil, A.C. Rectifier, H.F. Thermocouple, A.C./D.C. Moving Iron*

PORTABLE INSTRUMENTS
*D.C. Moving Coil, A.C. Rectifier, H.F. Thermocouple, A.C./D.C. Moving Iron, A.C./D.C. Dynamometer*

LABORATORY STANDARD INSTRUMENTS
*D.C. Moving Coil, A.C./D.C. Dynamometer*

CURRENT TRANSFORMERS · FREQUENCY METERS · ALL-PURPOSE TEST SETS AIRCRAFT INSTRUMENTS · RATIOMETERS ELECTRICAL THERMOMETERS · WESTON STANDARD CELLS · TACHOMETERS "PHOTRONIC" PHOTO ELECTRIC CELLS PHOTOMETERS

**SANGAMO WESTON LIMITED**
ENFIELD · MIDDLESEX
Telephone : ENField 3434 (6 lines) & 1242 (6 lines) *Grams* : Sanwest, Enfield

Scottish Factory : Port Glasgow, Renfrewshire
Port Glasgow 41151

Branches : London, CHAncery 4971
Glasgow, Central 6208 ; Manchester, Central 7904
Newcastle upon Tyne, Newcastle 26867
Leeds, Leeds 30867 ; Liverpool, Central 0230
Wolverhampton, Wolverhampton 21912
Nottingham, Nottingham 42403
Bristol, Bristol 21781
Southampton, So'ton 23328
Brighton, Brighton 28497

ELECTRICAL REVIEW

10 October 1958 Vol. 163 No. 15 Established 1872

# Developments in Generation

ANNUAL reports of authorities responsible for the public supply of electricity in Great Britain are more than statistical records of progress made (and it is unfailingly progress) in the period to which they ostensibly relate. In the information they present of work in hand or planned for service a few years ahead they reflect the rapidity of engineering development in this country. These developments can be seen in fuller perspective in the report for 1957–58 through the inclusion of outline particulars concerning the past decade.

In reviewing this report last week we noted some of the salient features of generation that have contributed largely to the advances made. In the first place the manufacturing potential has proved its ability to provide new plant of a capacity that has more than doubled the total kW installed in 1947 in addition to meeting the claims of an expanded export programme. At the same time full advantage has been taken of metallurgical developments that have led to the adoption of higher steam pressures and, more especially, higher temperatures necessary to secure the maximum fuel economy. The requirement that large modern generating sets shall be capable of two-shift operation indicates that the effects of wide temperature variations on heavy masses of metal are now well under control.

A most important point is that these advanced operating conditions are not increasing the capital expenditure per kW; plant commissioned or under construction last year at £50/kW was the same as the average 1947 figure, despite the very much greater cost of materials and labour. Neither has reliability been reduced as was evident by an availability of 92·2 per cent of output capacity last February. This view is confirmed by the success of unitary operation (one turbine–one boiler), which moreover indicates remarkable improvement in boiler availability even with the burning of " difficult " coals. Much of the capital saving must be attributed to the larger ratings of modern sets which have, additionally, enabled the average cu ft/kW of power station buildings housing the largest sets on order to be brought down to 28 compared with an average of 50 or so ten years ago.

Such representative achievements coupled with research projects now in hand certainly offer promise of further advances yet, such as the thermal efficiency of about 36 per cent predicted for generating sets now on order for commissioning five years hence. With the closing down of further obsolete plant, the saving in coal achieved through the improvement in efficiency for all stations and the growth of load should become progressively greater.

## FUTURE GENERATION PROGRAMME

It is estimated that by 1964 the plant capacity of the Central Electricity Generating Board will have to increase by nearly 50 per cent to keep pace with the rising demand for electrical power. Many factors influence the economic siting of generating stations and the route of transmission lines. While some of these factors are predictable, for example size of generators, efficiency, etc., others cannot be foreseen.

Forward planning of the electricity supply system entails the consideration of a large number of possible development programmes each based on various assumptions. To help in the assessment of these plans, the C.E.G.B. has installed a DEUCE computer which is described in this issue. All that is now required is a reliable computing engine for predicting the state of world fuel supplies, consumer demand, etc., for at least five years ahead. As it is, forward planning will still be something of a gamble.

## ELECTRICITY AND THE I.G.Y.

Comparatively few people appreciate fully the electrical significance of the International Geophysical Year, but this state of affairs should be very largely corrected by the article "Phenomena in the Upper Atmosphere" by Professor J. A. Ratcliffe which appears in this issue. The author says that much of the experimental work being done in this colossal international effort is concerned with the ionosphere and he visualises the presence of free charges of electrons and ions in that sphere as constituting a huge "atmospheric dynamo." Fundamentally then, the ionosphere investigations are practically entirely electrical in character and this must therefore be of concern to electrical science and engineering in the long run, although it will take a long time after the end of the I.G.Y. for the data collected to be investigated and interpreted for the benefit of the electrical world in particular, and mankind in general. But this part of the work by no means covers the electrical effort as a whole because numerous electrical instruments and precision equipment are in use for collecting and measuring information.

## MADE IN AUSTRALIA

The latest "Survey of Manufacturing Activity in Australia" is a useful reminder that the Commonwealth has a strong and well-established electrical industry. The Survey has been enlarged and improved by the inclusion of background information on the structure and development of Australian industry generally so that current movements can now be seen against long term trends. For example, the participation of British owned subsidiaries in local production is clearly shown, and emphasis is placed on the fact that since the war there has been not only an impressive increase in output but that the range of products made has been extended and their quality raised.

Although somewhat below the peak of two years ago production of electrical goods and apparatus continues at a high level and the future outlook is of a gradually expanding market. Imports, however, have fallen or failed to keep pace with production, and this underlines once again the obvious fact that the prospects for expanding British exports lie in using our technical resources to supplement, rather than directly compete with, products that can be easily made locally. This particularly applies to those products in which Australian manufacturers can already satisfy the home demand and are anxious to utilise their surplus capacity by developing exports.

## HENLEY'S AND A.E.I.

If it is accepted, the offer of Associated Electrical Industries, Ltd., to purchase the whole of the issued capital of W. T. Henley's Telegraph Works Co., Ltd., will involve a major operation in the electrical manufacturing industry; Henley's issued capital, preference and ordinary, amounts to £5,075,000 although the market valuation is much higher. The terms of the proposed acquisition are reported in our Financial Section.

A.E.I. has already taken over one large cable company, Siemens Bros., Ltd. (now merged in the subsidiary Siemens Edison Swan, Ltd.) and has other cable interests. The addition of the Henley business would give the A.E.I. group an interest in something like a fifth of the country's cable orders. The largest concern outside the group would be British Insulated Callender's; apart from this there are about a dozen other C.M.A. companies and a number of "independents," some of substantial size. The A.E.I. offer is, initially, conditional upon acceptance by the holders of 90 per cent of Henley's capital and judging by the comparative Stock Exchange prices at the date of the announcement it is very favourable to them.

## HIGH MOUNTING LIGHT SOURCES

An "extra" in the conference programme of the Association of Public Lighting Engineers at Harrogate recently was the demonstration, after Mr. L. C. Kalff had presented his paper, of a 10,000 W xenon lamp with a lumen output of 250,000. This experimental light source was produced by the Philips organisation. In terms of normal gas-filled lamp ratings this appears to give nearly double the output so that running costs would be considerably lowered. It was said that such a lamp might enable lighting engineers to dispense with half, if not more, of the present number of lamp standards in the towns. That would mean, of course, a considerable reduction in the capital costs.

This all appears to be a contribution to the revival of the idea of lamps of very high loading at very high mountings which seems to have been arrested by the war. We must be rather wary about speculations of this sort, however, because structures for very high mountings could obviously reach a point where measures to combat stresses brought about by weather conditions could mean additional capital expenditure.

### ANNUAL DOMESTIC ISSUE

Next week's *Electrical Review* will be the Annual Domestic Issue. In addition to surveys of the principal electrical appliances it will contain a number of articles by expert authors on various aspects of electricity in the home

# AERIAL CABLE

## 11 kV Polythene Insulated Cable With P.V.C. Sheath

**To comply with the requirements of rural preservation an h.v. plastic insulated aerial cable has been developed and the article describes the first project in which it was used**

By A. G. MILNE, Hons.D.F.H., M.I.E.E., A.M.I.Mech.E., A.M.B.I.M.*

TRANSMISSION and distribution networks are being carried farther into the remotest parts of the country and the problem of providing a means of supply which will overcome the twin objections of alleged spoiling of the countryside and planning and wayleave approvals is increasing. One such problem was posed recently to the engineers of the South Western Electricity Board.

An 11 kV main had to be routed down heavily timbered slopes to supply consumers at Hunters' Inn and neighbouring farms and cottages which are situated in the picturesque valley which runs down from Parracombe to Hunters' Inn and the Bristol Channel. As this is an area of outstanding beauty, overhead lines, if used, had to be unobtrusive, and tree cutting had to be avoided in order to preserve the scenery in the valley. These requirements ruled out the possibility of employing a standard h.v. overhead line, because not only would tree cutting on a generous scale have been necessary to provide a clearing approximately 50ft wide, but the result would have been to throw into relief the very thing it was intended to conceal.

The alternative of laying h.v. underground cables would have been prohibitively costly, especially as there would have been considerable excavation of rock and tree roots. The remaining possibility was the development of an insulated aerial cable which would retain the advantages of overhead line construction and, at the same time, remove the disadvantages associated with proximity to live bare h.v. conductors.

Some years previously, consideration had been given to the development of an insulated h.v. aerial cable for stringing on existing l.v. overhead lines to provide h.v. injection for reinforcement purposes and for erection in special conditions such as wooded country. An early attempt of this type employing a tough rubber insulated cable supported on a bare stranded steel catenary was described in the *Electrical Review* of 25th June, 1954. The cable, though operating satisfactorily, is too bulky and costly.

With the advent of polythene and p.v.c. insulation, an improved aerial cable was developed by the Board engineers and British Insulated Callender's Cable Co., Ltd., and for the first time was tried out on the Hunters' Inn project.

### Some Design Features

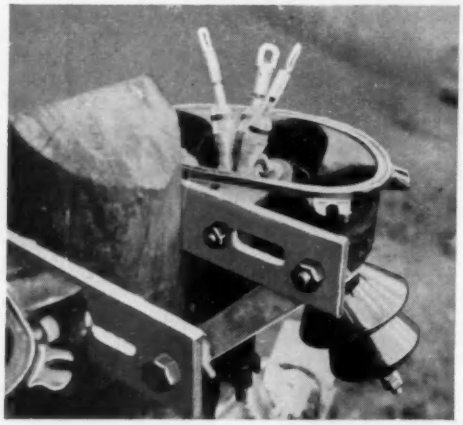
Before describing the cable in detail, it is important to stress that no extravagant claims are made for it, and that while it is satisfactory for the project described, it may not be so in other situations. It has certain limitations, mainly confined to its behaviour under fault conditions. These limitations were considered, and accepted as a reasonable and economic risk.

The first limitation concerns the fault capacity of the core electrostatic screen. The cores and screens of this particular cable are of aluminium, as lightness is of paramount importance. The total weight per yard is only 2·85 lb. In future, the screens will be of copper tape as this increases the short-circuit capacity by about 50 per cent. In the aluminium screen the maximum fault duty is limited to 1½ MVA per core. At Hunters' Inn, the distance from the main supply and the earth resistance value, limit the short-circuit fault conditions to approximately the same level. This limitation can be overcome readily, of course, provided there is no objection to an increase in cost, by employing stranded conductor in the interstices.

A further limitation is that owing to the thermoplastic nature of polythene under severe fault conditions there might be a tendency for the polythene insulation to flow,

* Deputy Chief Engineer, South Western Electricity Board.

*11 kV insulated aerial cable threaded through the trees in the wood. No lopping or felling was necessary*



*Compression jointing of aluminium lugs to aluminium conductor in conventional type pole box*

thus necessitating a replacement of the affected section. This is a risk which can be readily avoided by proper setting of protective devices limiting the conductor temperature to 95 deg C under short-circuit conditions.

A void formation due to differential expansion between polythene and conductor is prevented by application of a carbon paper screen which adheres to the polythene. The outer surface of the polythene is coated with bonded graphite before application of the core screen tape.

When considering the design in the early stages it was decided that a starting point would be to assume that the maximum fault duty likely to be experienced in the rural networks, for which the cable was required, would not exceed 75 MVA. In practice, the fault value would be considerably below this level in most parts of the network.

On that basis the cable was designed for the following maximum short-circuit rating for 0·2 sec:—75 MVA after continuous 200 kVA loading and 54 MVA after full-load operation. For a fault duration longer than 0·2 sec the short-circuit rating would be inversely proportional to the square root of the increase in duration. For example, if the duration was four times longer, i.e. 0·8 sec, the short-circuit capacity would be $\frac{75}{\sqrt{4}}=37{\cdot}5$ MVA.

## Details of the Scheme

The scheme required a total length of 790 yd of this cable in three separate section lengths. It was also found possible to erect a short length of l.v. mains on the same poles on one section in order to supply a number of farms and cottages en route. The longest section (485 yd) included two angle positions and the dual-construction section referred to above.

## Specification of Cable

Maximum voltage: 11 kV.

Conductors: 3×0·04 sq in aluminium (19/·052) circular.

Conductor screen: 2×0·005in carbon loaded paper tapes.

Insulation: polythene (Grade 2) minimum thickness 0·1in.

Core screen: graphite carbon paper aluminium foil 0·003in thick.

Sheath: extruded p.v.c. (black) nominal thickness 0·1in.

Catenary wire: galvanised steel 7/·080.

Weight: 2·85 lb/yd.

Current rating: 82 A continuous.

Cost: approximately £850 per 1,000 yd.

The cores are laid up and packed with jute fillers to form a circular cable section and the steel catenary wire is enclosed within the p.v.c. sheath to afford protection against corrosion.

## Method of Erection

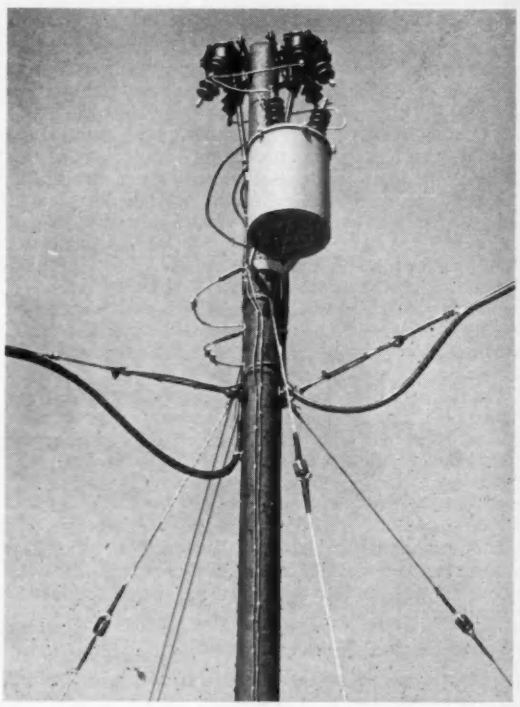
The cable was supported on wood poles with a normal span length of 150ft and a maximum span of 180ft.

It was normally mounted at pole-top level, but was lowered on the dual-construction section, where it was fastened to the pole at a point 10½in below the l.v. neutral. Sags and tensions for the cable under varying conditions are given in the table.

The minimum ground clearance was 15ft at points inaccessible to vehicular traffic and 20ft across open fields and roadways, the average pole size being 32ft by 8½in diameter. At straight line poles, the cable was attached by means of a catenary wire bracket and B.I.C.C. C-B insulators were used at angle positions, the p.v.c. web being cut to enable the catenary wire to be clamped in the insulator. The p.v.c. sheath over the catenary wire was not removed in either case.

At terminal positions the catenary wire was parted from the cable by carefully cutting the p.v.c. web and stripping back the p.v.c. sheath on the catenary wire, the catenary wire then being spliced on to the hook of a turnbuckle which was attached to the pole by means of an eye bolt, thus providing tension adjustment after the cable was erected. The bare portion of catenary was then coated with bitumastic paint.

The cable was pulled out over rollers mounted on the poles with intermediate rollers on the ground as required. Tensioning was carried out over the pole-top rollers and the sag measured in the normal way by means of sag



*A transformer tapping simply effected by terminating in conventional type pole boxes*

**Sag and Tension based on 150ft span**

| Temp. deg F Still Air | Tension lb | Sag ft |
|---|---|---|
| 22 | 895 | 2·95 |
| 40 | 863 | 3·05 |
| 60 | 828 | 3·2 |
| 80 | 797 | 3.325 |
| 122 | 742 | 3·525 |
| 22 with wind and ice | 1774·5 | 4·0 |

Basis: ½in radial ice
8 lb/sq in wind
Factor of safety, 2 at 22 deg F

battens. During erection an additional wire was clamped to the p.v.c.-covered catenary wire at angle positions to avoid cutting the p.v.c. web until its final position was known. This extra wire was run through a snatch block on the pole and allowed the cable to take up its correct position. The p.v.c. web was then cut for approximately 2ft on each side of the angle pole and the p.v.c.-covered catenary wire pulled in and clamped into the C-B insulator, leaving 4ft of the cable to hang in a loop. The p.v.c. web was reinforced by the application of p.v.c. tape at points of separation so as to prevent any possibility of tearing.

## Jointing

As this is a new type of cable, jointing techniques had to be developed and terminations were made in modified conventional type 11 kV pole-mounted trifurcating boxes.

The p.v.c. sheath was stripped back to the point of entry into the box and at this point the web was cleaned off with a rasp. A thick neoprene washer was fitted over the cable and compressed into position by means of a tapered gland which clamped on to the base of the box. A neoprene breeches piece was fitted over the three cores of the cable above the gland to prevent compound migration.

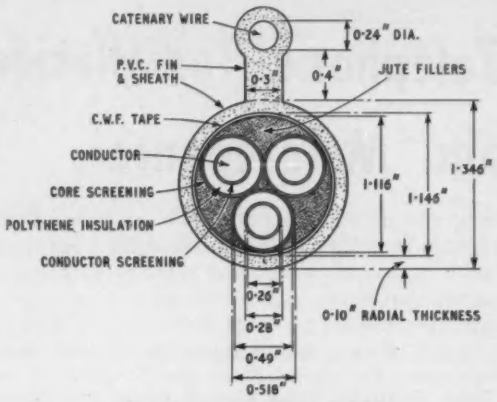
The electrostatic screen on each core was terminated immediately inside the trifurcating box in a conventional type stress cone formed with polythene tape and lead wire. Half-an-inch of small-gauge tinned copper binding wire was applied tightly over the tape screen before applying the lead flashing to ensure a good earth connection. The screens were connected together and earthed at the supply end of each section only.

The original intention was to sweat joint the terminating lugs inside the pole box. The first trial attempts proved that damage through heating of polythene could ensue. Accordingly, the Board engineers called on their extensive experience in aluminium compression jointing on cable and overhead line work and devised a successful compression joint, thus effecting an efficient connection without heating and use of metal pots, etc. The box was filled with cable compound.

New types of termination and straight-through joints are being developed. The entire construction work was carried out by the Board's Central Construction Department.

## Remarks on Construction Work

One of the main features of this cable is the ease and speed with which it can be pulled out and, in fact, the long section of 485 yd was pulled out by hand, with a gang of 12 men in from 15 to 20 minutes. It was also found possible to pull it to within two or three feet of its normal sag at 50 deg F with eight of the men, the remainder being employed at the angle positions and for passing signals through the line. Terminations presented no problems and it was a simple matter to strip off a short




*H.v. plastic insulated aerial cable*

piece of p.v.c. from the catenary wire near the terminal pole so that the draw tong could be attached and the cable pulled to its correct sag by means of a "Pul-lift" or draw tong and ratchet.

No difficulty was experienced in clamping the catenary wire to the C-B type insulators used at angle positions by making use of the technique already described. Branches of trees adjacent to the cable route still overhung the cable to form a tunnel and for practically the whole of the route the cable and poles were invisible from the roads.

---

## E.R.A. Reports

**Domestic Immersion Heater Failures.**—The first part of the report Ref. Y/T21 "Failures of Domestic Immersion Heaters caused by Corrosion and Scale Formation" by A. Morris Thomas (price 21s) consists of a résumé of published work on metallic corrosion and scale formation, with special reference to the performance of domestic immersion heaters. General principles are discussed, including the effects of domestic water supply characteristics and high temperatures. Corrosion and scale inhibitors, resistant alloys and other protective measures are critically reviewed. Part 2 deals with the results of a statistical survey of immersion heater failures in Great Britain, based on answers to questionnaires circulated to districts of the Electricity Area Boards, the data being analysed with respect to water hardness. The economic importance of immersion heater failures is assessed on the basis of the monetary loss to users over a period of years.

Experimental investigations to find the cause of failure and reduce the number occurring in districts where this is large are considered economically and technically justifiable. Suggestions for remedial measures for immediate application are also made. A summary of the answers to a questionnaire relating to various aspects of immersion heater failures is given in an appendix.

**Plug and Socket Contact Temperatures.**—Adaptors for plug and socket outlets to B.S. 1363 : 1947 are required by the I.E.E. Wiring Rules to be fitted with a fuse of 13 A maximum rating, and as the heat produced by the fuse would result in a higher temperature rise of the socket contact than would occur with a non-fused adaptor the E.R.A. was asked to investigate the temperature rise associated with both types. Temperature measurements were made only at the points for which temperature-rise figures are specified in the B.S. and the test results are given in the report Ref. G/T311 "The Temperature Rise of the Terminals of Plugs and Socket Outlets to B.S. 1363: 1947 with Special Reference to Adaptors" by H. W. Baxter (price 6s).

Copies of these reports are available, at the prices indicated, from the Electrical Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

# Telephone Installation and Maintenance

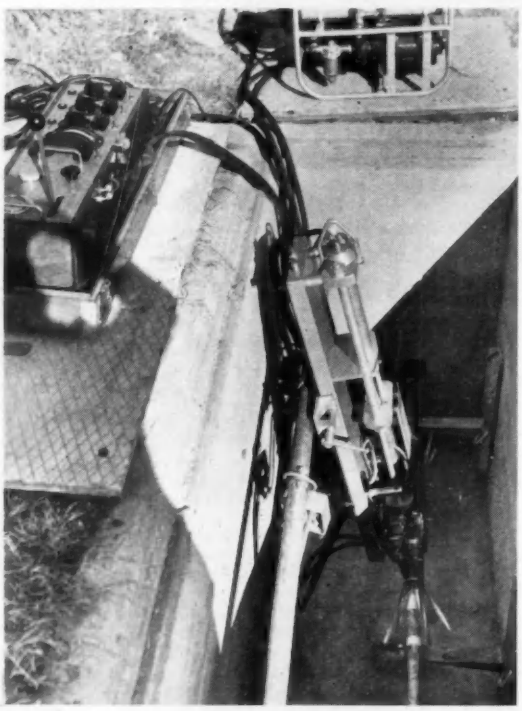
## ELECTRICAL AND MECHANICAL AIDS

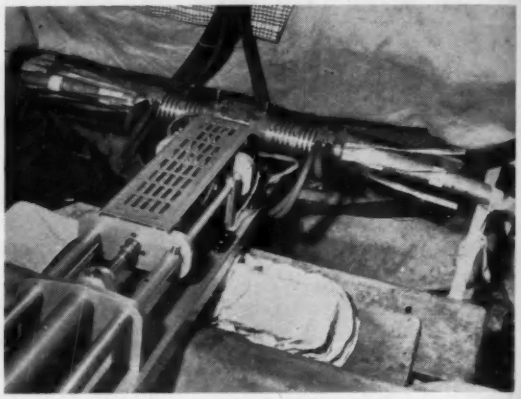
A DISPLAY was held recently by the Post Office Engineering Department at the new Telephone Service Centre, Orphanage Road, Watford, primarily to demonstrate to G.P.O. staff the various types of electrical and mechanical equipment available for installation and maintenance work. The exhibition included propane gas plumbing equipment, soldering irons, portable generating sets, various types of mechanical handling trucks, vehicle-mounted ladders, etc.

The main interest of the exhibition was centred round a demonstration of submarine cable jointing. The basic construction of a coaxial submarine cable consists of the centre conductor of copper insulated by a solid polythene dielectric and an outer conductor of preformed copper return tapes bound in by a copper binder tape. Joints are made by brazing the centre conductor. The electrical brazing machine operates from a single-turn secondary winding of a transformer.

After brazing the centre conductor, the solid polythene dielectric has to be replaced. This is achieved by an injection moulding machine. Solid polythene is electrically heated and injected by hydraulic pressure into a jig containing the centre conductor. The injected polythene is effectively fused with the polythene core on each side. The moulded dielectric joint is then X-rayed. The X-ray apparatus and camera is fitted with the joint and an interlock key removed. This key can then be inserted into the remote control equipment and an X-ray photograph of the joint taken. This interlocking system ensures that the operator is at a safe distance from radiation.

*Submarine cable jointing apparatus in position*





*Submarine cable jointing, showing the injection moulding jig in place over the centre core*

The presence of dirt, metal particles or voids in the polythene dielectric is shown on the developed X-ray film. If on examination of the film the joint is found to be satisfactory the return tapes of the outer conductor are brazed and the remaining protection of the cable joint is completed.

Also on show at the exhibition were the test van equipped as a model darkroom and a "Land Rover" with a power take-off to drive the 6 kVA, 110 V alternator which provides the power supply for the brazing and X-ray equipment.

## Plant Engineers

THE headquarters of the Incorporated Plant Engineers was transferred last month from the Midlands to 2, Grosvenor Gardens, London, S.W.1. Membership is now nearly 4,000 of whom more than 500 are overseas members.

The institution recognises that the term "plant engineer" covers a wide range of people and functions and has framed its membership requirements so that applicants with modest academic qualifications are not necessarily excluded. A plant engineer is defined as one who, by virtue of the combination of his education, training and experience, is able to assume personal responsibility for the development and application of engineering science and knowledge in research, development, specification, design, construction, manufacture, management and the education of other plant engineers.

Education and training have been a main concern of the institution from its inception and the Education Committee took a major part in the establishment of the City and Guilds of London Institute's certificate in plant engineering (course 187).

The institution holds an annual national conference in May and general meetings in London and in its branches. Refresher courses for works and plant engineers are conducted annually in various industrial centres. The *Journal* of the institution recording its transactions is published in alternate months.

# PHENOMENA IN THE UPPER ATMOSPHERE

## Electricity and Magnetism in the Geophysical Year

By J. A. RATCLIFFE*

**During the International Geophysical Year, which began in July, 1957, and extends to December next (and is thus really a year and a half) a considerable part of the scientific effort is being devoted to experiments concerned with the ionosphere. The purpose of this article is to explain the background of knowledge against which these experiments are being carried out and to discuss what kind of new results may be expected**

AN important part of the experimental work which is being conducted during the International Geophysical Year is concerned with the ionosphere. It should be explained that the density and pressure of the atmosphere fall off rapidly as the height increases, so that, above about 100 km, the pressure is less than $10^{-5}$ atmosphere and is as low as that in a really good vacuum in the laboratory. This low-pressure gas is ionised by X-rays and ultra-violet light impinging on it from the sun. In a laboratory discharge-tube the free electrons released when ionisation occurs rapidly disappear either by attachment to neutral molecules, or by recombination with positive ions, but in the upper atmosphere there are relatively so few molecules or ions that the electrons persist for a long time. For example, at a height of 250 km they probably remain free for two or three hours, and at a height of 100 km, where the pressure is greater, for about 20 min. There is thus an appreciable population of free electrons at heights above about 70 or 80 km; for instance, at 100 km there are, by day, about $5 \times 10^4$ per c.c. and at 250 km about $10^5$ per c.c. The ratio of the number of free electrons to the number of heavy particles (atoms or molecules) at these two heights respectively is about $10^{-8}$ and $10^{-4}$. The part of the atmosphere which contains important numbers of free electrons is called the ionosphere. It is being studied intensively during the I.G.Y.

### The Atmospheric Dynamo

The presence of free charges in the ionosphere, in the form of electrons or ions of atomic mass, means that currents can flow if an e.m.f. is present. Now it is known that the air in the high atmosphere oscillates under the gravitational attractions of the sun and moon as the water in the oceans does, and these tidal oscillations carry the free charges with them backwards and forwards across the steady magnetic field of the earth. A huge "atmospheric dynamo," in which the conducting armature is the ionosphere, therefore exists at a height of about 100 km. The e.m.f.s induced are determined by the velocity of the air and the magnetic field, but it is not entirely a simple matter to decide what currents flow as a consequence of these e.m.f.s.

To see the kind of problem involved let us consider a simple electrical experiment of the kind indicated in Fig. 1 in which PQRS represents a loop of wire and CD, a movable wire in contact with the loop which can be slid along PQRS at a place where there is a magnetic induction B perpendicular to the plane of the paper. When CD is moved with a velocity v there is an e.m.f. vB in the movable wire, so that electrons in the wire will move. There is also a current through the loop CQRD and it is pertinent to ask what is the origin of the electric field which causes the electrons at (say) the point Q to move. The answer is that the first result of moving the wire CD is to set up, along the stationary wire, an electrostatic charge distribution which we shall call a polarisation charge, and that this produces an electrostatic "polarisation field" which then acts on an electron at any point, such as Q, in the stationary wire, and causes it to move. Without this polarisation there would be no force to move the electron at Q.

In the ionosphere there is a similar state of affairs. The induced e.m.f.s, caused by the motion across the magnetic field, are strong in some places and weak in others and to produce a flow of current in closed loops they first build up electrostatic polarisation charges, so that the fields of these charges assist the movements of the electrons in places where the induced e.m.f.s are weak. The result is that currents flow overhead in the ionosphere in great loops, as shown in Fig. 2, which represents the earth as seen from the sun. During the day any one point on the earth will travel beneath this current system from left to right. The magnitudes of the currents are quite large, 10,000 A flows between each of the lines on the figure, so that, between the equator and a point at about latitude 35 deg there is a current of about 60,000 A.

The current system of the ionospheric dynamo can be studied most simply by observing its magnetic effects. As the earth rotates, and sweeps an observer from left to right beneath the current, the magnetic field will alter both in magnitude and direction, so that, being added to the permanent magnetic field of the earth, it will cause a compass needle to perform a small repeated diurnal variation. It is from a study of these variations that current maps, such as those of Fig. 2, have been constructed.

Although Fig. 2 represents the general form of the current flowing in the atmospheric dynamo there are

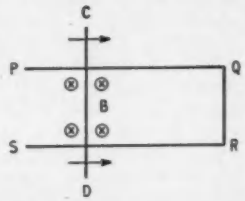



*Fig. 1.—A simple dynamo*

* Cavendish Laboratory, Cambridge.

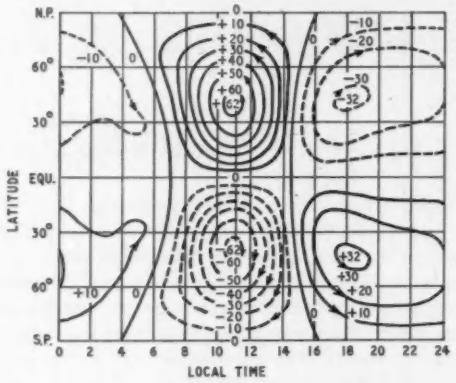



*Fig. 2.—Currents near a height of 100 km. 10,000 A flows between successive contour lines. The currents remain fixed relative to the sun and an observer is carried past so that his local time at successive points is as shown on the time scale*

some finer points which are not well understood: these are being closely examined during the I.G.Y. One of these concerns the region near the magnetic equator.* Here the diurnal variations of the magnetic field are pronouncedly greater than elsewhere and vary with local time in a different way. It is as though there were a local enhancement of the ionospheric current round the region of the magnetic equator, an enhancement which has been called the "equatorial electrojet." Attempts will be made, during the I.G.Y., to locate it, both in height and plan position, by comparing the diurnal magnetic variations at a series of points spread in a N-S line across the magnetic equator.

## Normal Ionospheric Layers

The free electrons in the ionosphere can reflect radio waves sent vertically upwards if the frequency is small enough. Observations of waves reflected in this way are made regularly at a large number of ionospheric observatories distributed over the earth. Routine observations are usually presented in the form of curves known as ionograms, which show how the time delay of a short train of radio waves, reflected from the ionosphere, depends on the radio wave frequency. A sample is shown in Fig. 3. Here, as usual, the time delay is expressed in terms of an "equivalent height" which shows the height from which the wave would have to be reflected to have the observed time delay if it travelled all the way with the free-space velocity.

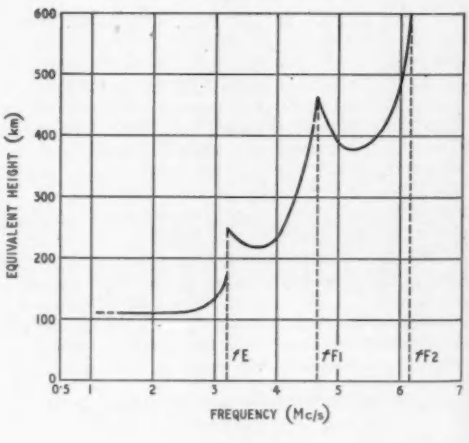
The most striking features of these ionograms are the more or less sharp breaks at the "critical" frequencies marked fE, fF1 and fF2 in Fig. 3. These represent frequencies at which a "layer" of electrons is penetrated by the waves, and the vertical distribution of electrons corresponding to the ionogram of Fig. 3 is shown in Fig. 4. The main purpose of ionospheric research is to determine the behaviour of the three layers E, F1 and F2 and to explain it. Most of the work up to now has been concerned with recording the "critical frequencies," which are directly related to the peak electron densities of the three layers marked $N_mE$, $N_mF1$ and $N_mF2$ in Fig. 4. The critical frequencies of the E and F1 layers vary with time of day, and of season, and with geographical position on the earth, roughly as would be expected on a simple theory of layer formation first worked out by Chapman. When, however, these frequencies are examined more closely there are found to be regular departures from the simple behaviour, which will be clearer after the I.G.Y. It appears likely, at present, that some, at least, of these departures are the result of regular vertical movements of the layers. Movements would be expected in the E layer because of the forces exerted on the current loops of the dynamo theory by the permanent magnetic field of the earth; for example, the loops shown centred near the line 1100 hours in Fig. 2 would tip *downwards* at the poles and *upwards* at the equator. There is already some evidence for a movement of this kind, but it is not at all clear.

## Determining Electron Distribution

When the critical frequency of the F2 layer is considered it is found to behave in a manner markedly different from that expected on simple theory, both as regards its variation with time (diurnal and seasonal) and with position on the earth. Indeed it becomes apparent at once that this region is so "anomalous" compared with a simple region that deductions cannot properly be made from a study of the critical frequency (or peak electron density) alone, and that the whole shape of the layer should be studied. One objective, therefore, of work during the I.G.Y. has been to develop and apply methods of calculation which allow the electron distribution throughout the layer to be determined from the experimentally determined ionograms. The Radio Research Station of the D.S.I.R. has taken a lead in this matter and is already publishing these electron distributions for selected days from three of its observatories. Observations from other organisations are expected to follow, so that soon after the end of the I.G.Y. there should be available a skeleton knowledge of the world-wide distribution of electron density in the F region.

It is already clear that some of the "anomalies" in the behaviour of the F2 layer are the result of large-scale vertical movements, and when more experimental results are available these should be measurable. It is of interest to discuss one particular mechanism by which they could be produced. It has already been explained how in the "dynamo" region, at a level near 100 km,

*Fig. 3.—A typical ionogram of the type made regularly at ionospheric observatories*




* The permanent magnetism of the earth corresponds to that of a bar magnet with its axis inclined at about 12 degrees to the spin axis of the earth. The magnetic equator is the line in which the plane of symmetry of this equivalent bar magnet cuts the surface of the earth: it is inclined to the geographic equator.

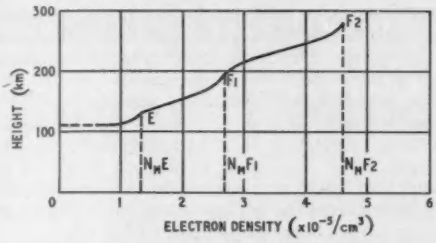



*Fig. 4.—The distribution of electron density, in electrons per c.c., corresponding to the ionogram of Fig. 3*

there is built up an electrostatic polarisation. Now the electric field resulting from this polarisation extends to the heights (near 250 km) where the F2 layer is situated and there, acting upon the free electrons in the presence of the earth's magnetic field, causes them to move. The behaviour is similar to what would happen in the arrangement of Fig. 5, where the wires CD and PQ are both situated in a magnetic field, and are both free to move. If CD is moved it acts as a primitive dynamo, with the result that a polarisation is built up along the wires CPQD as already explained in connection with Fig. 1. This polarisation then drives current through PQ and causes it to move, like a primitive motor, in the magnetic field. CD then corresponds to the "atmospheric dynamo" region in the ionosphere and PQ corresponds to the F2 region, which behaves like an "atmospheric motor." The "motor movements" in the F2 region will be both vertical and horizontal: only the vertical ones are in question here, the horizontal ones will be discussed later.

## Ionospheric Storms and Solar Disturbances

It is well known that the frequency of appearance of sunspots on the solar disc varies with an eleven-year periodicity, and the appearance of spots is closely related to the occurrence of violent disturbances in the ionosphere which are noticed as aurora, magnetic storms, and irregular radio transmission. The I.G.Y. has been chosen to be near a maximum in the eleven-year cycle of solar activity so that an especial study could be made of these so-called "ionosphere storms."

Two types of ionosphere disturbances are usually distinguished; called respectively a sudden ionosphere disturbance (S.I.D.) and an ionosphere storm. The S.I.D. is the result of the emission of a burst of ultra-violet or X-rays from the sun and is evidenced by an increase in the ionisation of the lowest ionosphere, at heights of about 80 km, on the sunlit side of the earth.

The ionosphere storm is caused by a stream of particles, ejected from the sun, impinging on the earth. A storm often follows about 24 to 36 hours after a S.I.D.; on these occasions it appears that the particles left the sun when the ultra-violet burst occurred but, because of their slower speed, took a longer time on their journey. Precisely what happens during an ionosphere storm is not at all clear. On one theory the stream of charged particles coming from the sun is held up as it approaches the earth by the earth's magnetic field so that it forms a "ring current" round the earth at a distance of several earth radii. The magnetic effect of this current is noticed all over the earth, on the dark and light side equally, as what is called the "sudden commencement" of a magnetic storm. Next, by some mechanism not properly understood, it is thought that charged particles from this ring are accelerated towards the earth, being guided to the polar regions by the earth's magnetic field, so as to impinge mainly along the "auroral zones" distant about 20 deg from the magnetic poles. As the accelerated particles penetrate the atmosphere they give rise to visible light, observable as the aurora and, when they reach the level of about 100 km and less, they produce intense ionisation. This ionisation leads to the enhanced currents in the atmospheric dynamo which disturb the magnetic field all over the earth and produce a magnetic storm. The magnetic effects are most marked near the auroral zone, where it appears that there is an intense ring of current in the dynamo region, often called the "auroral electrojet." A string of observing stations across the zone is being used during the I.G.Y. in an attempt to locate the position of this electrojet.

The particles entering the atmosphere near the auroral zone also cause a marked increase in the absorption of radio waves in the polar regions, sometimes so great that no reception is possible. The phenomenon is then called a "polar blackout."

The occurrence of a magnetic storm is evidence that the current system in the atmospheric dynamo is different from normal. The different current is accompanied by a different electrostatic polarisation, so that the electric field, produced by the dynamo region at the level of the F2 region, is also altered, and this, in turn, means that the movements of the F2 region are altered. The results of these movements are clearly noticeable in the ionograms recorded during storms as may be seen in Fig. 6 where ionograms for a normal and a storm day are compared. The precise nature of these changes, as observed all over the world during a few major storms, may be expected to emerge from studies during the I.G.Y.

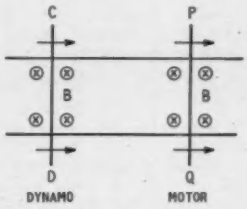



*Fig. 5.—A simple dynamo and motor*

## Horizontal Movements in the Ionosphere

The amplitude of a radio wave reflected from the ionosphere does not vary smoothly over the ground, as it would if it were reflected from a smooth mirror; instead it varies irregularly from point to point and from time to time. It is as though the ionosphere were "rough" or "rippled" much as the surface of a pond might be rough or rippled, so that light reflected from a street lamp on to a roof would show a variable patchiness. From these irregularities of amplitude it is possible to make deductions about the ionospheric irregularities and to study their motions.

Intensive studies of these irregularities at one or two places over the past few years have revealed the presence of some consistent horizontal velocities in the layers. For example, over England, the F layer moves towards the east by day and the west by night, while in the E layer it has been possible to separate an overall movement towards the east on which are superposed an annually varying movement towards the east in the summer and the west in winter, and a diurnally varying one which is roughly constant in velocity, but rotates twice in 24 hours.

The movements in the E region probably represent real movements of air; those in the F region are probably

produced by electric fields originating in the dynamo region.

The studies of these irregularities and movements have, so far, been mainly confined to one or two places. If they are to be properly understood they must be observed at several places on the earth, over a period of at least a year, and that is being done during the I.G.Y.

## The Fringes of the Ionosphere

Radio waves sent up from the earth can be reflected only from below the peak of the F2 layer and can therefore bring back information only about levels lower than that. One method of investigating the ionosphere at

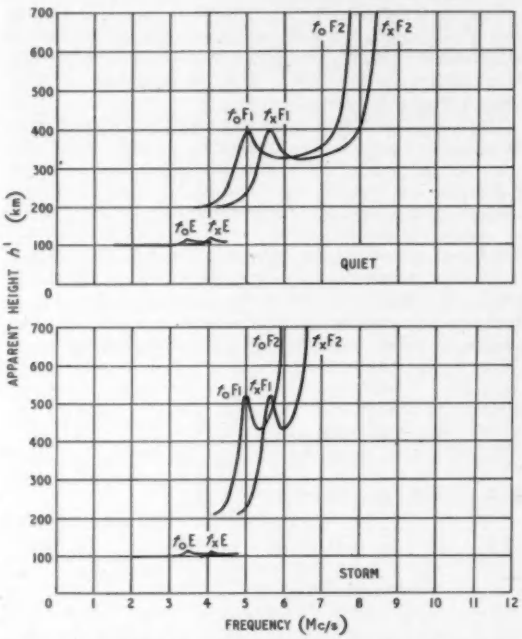



*Fig. 6.—Ionograms for a magnetically quiet and a magnetically stormy day. (The second traces marked fx can be ignored for the present purpose)*

greater heights is to put a radio transmitter in an artificial satellite and to make measurements on the waves arriving at the ground. If the waves are to be sensitive to the presence of the ionosphere they must not be of too great a frequency; that was the reason why, in the first Russian satellites, frequencies of 20 and 40 Mc/s were used. By comparing the phases, or what is the same thing, the Doppler-shifted frequencies, of these two transmissions some preliminary information has already been obtained about that part of the ionosphere above the F2 peak.

Quite a different method of exploring the outer ionosphere makes use of the strong radio transmitters provided by nature in the form of lightning flashes. These radiate powerfully in the region of low audible frequencies, and the waves can penetrate the main ionospheric layers. In general, it can be said that low-frequency waves do not penetrate the ionosphere, but the action of the earth's magnetic field renders the ionosphere bi-refringent in such a way that, at the very lowest frequencies, part of the wave gets through. The outer ionosphere, under the influence of the earth's magnetic field, then acts so as to guide the wave along a line of force of that field, down to the ground in the other hemisphere, as indicated in Fig. 7, and at the same time to disperse the wave so that the higher frequencies arrive before the lower. If, therefore, the radiation is received at the distant end of the line of force it can be recorded as an "audio-frequency atmospheric," often called a "whistler."

Whistlers, originating in a lightning flash at a point represented by A in Fig. 7, have been observed after travelling over paths represented by AB and also after being reflected from the surface of the earth one or more times so as to travel over paths ABA, ABAB, etc.

The dispersion in the received whistler, measured by the time interval between the arrival of the high and low audio frequencies, depends on the length of the path and on the concentration of the electrons, particularly at the outermost point. The position of this outermost point is determined by the line of force of the earth's

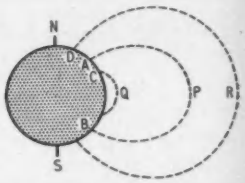



*Fig. 7.—To illustrate the paths followed by "whistlers"*

magnetic field and can be altered by altering the observing point, as shown in Fig. 7. Observations of whistlers at different latitudes, such as ACD, will allow the outermost reaches of the ionosphere at points P, Q and R, distant several earth radii, to be investigated during the I.G.Y. It is probable that, at these distances, the ionosphere of the earth merges into the "ionosphere" of the sun, usually known as the solar corona.

## Organisation of Observations

In this article a selection has been made of some of the most interesting problems concerning the earth's magnetism and electricity, which are being investigated during the I.G.Y. There are many others, but all have in common that if they are to be properly solved observations are required at several places simultaneously. It has therefore been arranged that, when possible, all observers should record on four "regular world days" each month. In addition, an organisation has been set up to study the sun, and radio waves reflected from the ionosphere, for the purpose of trying to forecast when ionospheric storms may be expected. If forecasts of this kind could be relied upon they would be of great value to the commercial radio organisations, but, as is well known, they are not. It has therefore been necessary, for purposes of the I.G.Y., to broadcast world-wide "alerts" to all observers warning them to be ready, and then later if a storm seems to be particularly likely, to broadcast the signal to start world-wide observations in what has been called a "special world interval." Several ionospheric storms have already been observed on a world-wide basis in this way.

## Conclusion

When the I.G.Y. ends, there will be a mass of observations on a scale never before achieved in work of this kind. To make it available to all it will be collected in three "World Data Centres." It is most important that its collection and storage should not mark the end of the I.G.Y. activities. Investigators will be encouraged, by grants and other assistance, to turn their attention in the succeeding years more to analysis of this mass of results than to the making of still more numerous observations.

# Electricity Tariff's Effect on a Sugar Refinery

By OLIVER LYLE

**In this article Sir Oliver Lyle analyses the cost of producing electricity in a sugar refinery by back-pressure plant. He also deals with the exchange of power between the refinery and the Electricity Board and contends that to operate profitably the refinery must employ the wasteful method of generating condensing. The author attributes this to the unsuitability of the tariff**

THE Plaistow Wharf Sugar Refinery of Tate & Lyle, Ltd., uses just over a ton of steam to refine a ton of sugar. If the steam is raised at 650 p.s.i. and used in the process at 70 p.s.i., the steam for each ton of sugar can generate about 90 kWh. The refinery uses about 60 kWh per ton, leaving a surplus of about 30 kWh per ton for export to the London Electricity Board. At the normal throughput of 100 tons an hour the turbine produces about 9,000 kW, the refinery load is around 6,000 kW and the export averages 3,000 kW. The turbine is a straight back-pressure set and the factory acts as its condenser. If excess power is to be generated, over and above that produced by the process steam requirements, the factory must condense the extra steam which calls for the evaporation of water that has been deliberately used for diluting liquors.

## Back-Pressure Power Generation

The total cost of back-pressure generated electricity used in this refinery is 0·6d per kWh, when all the fixed charges are debited to the 6,000 kW internal load. This cost amounts to

$$\frac{6{,}000 \times 130 \times 51^{*} \times 0{\cdot}6}{240} = \text{£99,450 a year}$$

Had the current been bought from the London Electricity Board it would have cost upwards of 1·0d/kWh, or

$$\frac{1{\cdot}0 \times 6{,}000 \times 130 \times 51}{240} = \text{£165,750 a year}$$

plus the maximum demand charge which can be estimated as

$$\frac{11{\cdot}5 \times 12 \times 6{,}600}{20} = \text{£45,000 a year}$$

plus an estimated extra service charge of £6,000 a year

a total of £216,750 a year

So back-pressure generation shows a profit of £117,000 a year in this, the smallest of Tate & Lyle's refineries.

## Exported Power

The cost of generating exported current is simply the marginal heat cost. The steam is, in any case, required for process and if it did not go through the turbine it would go through a reducing valve. So that, with coal at 105s a ton containing 10,800 B.Th.U./lb, boiler efficiency 84 per cent and turbo-generator efficiency 95 per cent, the marginal cost of power is

$$\frac{3{,}415 \times 105 \times 12}{0{\cdot}84 \times 0{\cdot}95 \times 2{,}240 \times 10{,}800} = 0{\cdot}223\text{d/kWh}$$

say ¼d/kWh.

The refinery receives from the London Electricity Board an average payment for this current of almost exactly ¾d/kWh, on approximately 3,000 kW—say 2,750 kW. The annual net receipts for export current are therefore

$$\frac{(\tfrac{3}{4} - \tfrac{1}{4})\,2{,}750 \times 130 \times 51}{240} = \text{£31,500}$$

In addition, during the four winter months, there is a minimum supply payment of 10s per kW per month. The minimum supply can conservatively be taken at 1,250 kW, yielding £2,500, so that the gain from export is £34,000 a year.

The capital cost to be set against exporting current is the expense that was incurred by rearranging things so that the whole of the process steam could be sent through the turbine. Previously, boiler make-up had been produced in a quadruple-effect still working from 250 p.s.i. to 70 p.s.i. This still was replaced by two low pressure stills, one on each side of the accumulator, working as a near double-effect between 70 p.s.i. and 15 p.s.i. These stills cost £13,500 installed, with £35,000 for piping, controls, instruments, valves and pumps—a total of £48,500. The same size of turbine would probably have been installed even had the export of current not been contemplated, as an insurance against future increase of load; so no part of the turbine need be charged to export.

Exporting current, therefore, yields £34,000 a year on a capital cost of £48,500, or a return of 70 per cent. Of course, as further steam economies are made in the process and/or if there is a greater electrical demand, the amount of current available for export will dwindle.

## Coal Saving

The coal saving is substantial. The refinery generates electricity with a coal consumption of

$$\frac{3{,}415}{0{\cdot}84 \times 0{\cdot}95 \times 10{,}800} = 0{\cdot}396, \text{say } 0{\cdot}4 \text{ lb coal per kWh.}$$

Brunswick Wharf, the nearest C.E.G.B. station, has an efficiency of 28·6 per cent and assuming it uses similar coal it would burn

$$\frac{3{,}415}{0{\cdot}286 \times 10{,}800} = 1{\cdot}1 \text{ lb coal per kWh}$$

For every unit the refinery generates for its own use or

* Public holidays reduce the working year by one week.

for export it achieves a saving for the nation of (1·1 − 0·4) = 0·7 lb of coal, or a total of

$$\frac{0{\cdot}7 \times 9{,}000 \times 130 \times 51}{2{,}240} = 18{,}500 \text{ tons a year}$$

for this refinery, or over 50,000 tons for Tate & Lyle's three refineries.

All this is very profitable and quite straightforward, but when exceptional circumstances arise they lead to most undesirable complications.

## Maximum Demand Charge

If for any reason the refinery is on a reduced throughput, not caused by shortage of steam, and is not generating any surplus power for export, and if it requires an extra kWh it can either generate it condensing or import it from the London Electricity Board. If it generates condensing it must debit the power with the cost of the steam used, not just the power heat. The marginal steam cost is 5s 10d per 1,000 lb or 0·07d/lb. The marginal turbine steam rate is 20 lb/kWh, so that power generated condensing costs 20 × 0·07 = 1·4d/kWh.

If the refinery imports power it pays about 1·0d per kWh plus a maximum demand charge of £2 6s 0d per kW during the four winter months. The maximum demand hours in these four months (November, December, January, February) are for 12 hours a day, 5 days a week, and the months contain 120 days, totalling

$$\frac{12 \times 120 \times 5}{7} = 1{,}030 \text{ hours.}$$

The extra cost of generating condensing over importing is 1·4 − 1·0 = 0·4d/kWh.

Therefore the extra cost of condensing generation per kWh for four months is 0·4 × 1,030 = £1 14s 4d compared with the maximum demand charge of £2 6s 0d.

It will, therefore, always pay to try to generate condensing rather than incur a maximum demand in the four winter months.

In the remaining 8 months, the maximum demand charge is 11s 6d per kW per month. The maximum demand hours in one of these months average

$$\frac{(365 - 120) \times 12 \times 5}{8 \times 7} = 263$$

So the extra cost of generating condensing in one of these months is

$$0{\cdot}4 \times 263 = 8\text{s } 9\text{d}$$

compared with the maximum demand charge of 11s 6d.

It will, therefore, always pay to try to generate condensing rather than incur a maximum demand in the eight non-peak months.

## Christmas Stop

The refinery usually shuts down for one day, sometimes two days, more than the public holidays at Christmas. If it cannot come to an arrangement with the London Electricity Board to waive the maximum demand charge on these days it wants to know the minimum load it would pay to generate condensing rather than incur the maximum demand by buying from the London Electricity Board.

The whole boiler house costs on such holidays must be debited to power generation. To run the boiler house in these circumstances will cost around £200 a day or 48,000 pence. As this figure includes all the fixed boiler house costs all the steam can be taken at marginal cost. The no-load turbine steam consumption is 40,000 lb/hr or 480,000 lb/12 hour day, costing 480 × 70 pence/day.

The marginal steam rate is 20 lb/kWh costing 20 × 0·07 or 1·4d/kWh.

Imported power costs 1·0d plus maximum demand charge of 552d per kW.

Let the load to make imported power break even with condensing generation for one 12-hour day be $x$.

Then, $48{,}000 + (480 \times 70) + (12 \times 0{\cdot}4x) = 552x$

It will, therefore, pay to generate condensing rather than import at maximum demand if the load exceeds

150 kW for 1 day
300 „ „ 2 days
450 „ „ 3 days

In practice under these Christmas conditions the back pressure would be reduced from 70 p.s.i. to say 5 to 10 p.s.i. This would reduce both the fixed steam and the marginal steam considerably, so that the minimum economic loads would be much reduced.

## Minimum Supply Payment

When the refinery exports current, it receives a minimum supply payment during the four winter months of 10s per kW per month. The value of this per daytime hour is

$$\frac{10 \times 12 \times 7 \times 4}{12 \times 120 \times 5} = 0{\cdot}446\text{d/kW}$$

To generate 1 kWh condensing costs 1·4d/kWh. The value of 1 kWh back pressure is what it can be sold for to the London Electricity Board in the daytime, say 0·75d/kWh. The extra cost of generating condensing (to make sure of not forfeiting the minimum supply payment during a period of low process steam demand) is (1·4 − 0·75) = 0·65d/kWh.

To be all square the refinery can, therefore, afford to generate condensing for $\frac{0{\cdot}466}{0{\cdot}65}$ or 72 per cent of the time.

A longer period of generation would result in the extra cost of generation exceeding the minimum supply payment. As the process valleys, when the minimum supply payment might be lost, cannot conceivably cover 70 per cent of the time, it will always pay to try to generate condensing rather than risk forfeiting the minimum supply payment.

## Inefficiency and Demoralisation

When the refinery generates condensing it uses five times as much coal as it does when generating back pressure, and 2½ times as much coal as Brunswick Wharf. That it should have to save money by wasting steam is deplorable. The whole process discipline of a sugar refinery centres round processing its liquors with the least amount of water in them. Condensing generation calls for the evaporation of extra water that has been deliberately used for diluting liquors. Although, of course, the conditions just considered are the exceptions, not the rule, they show that for concerns such as sugar refineries the electricity tariff is quite unsuitable and works against the national interest.

---

## Steels at High Temperatures

DATA from tests on wrought steels carried out at the creep test station of Imperial Chemical Industries have been presented to the Institution of Mechanical Engineers by Messrs. B. J. Connolly and G. Boyd. Although the paper is concerned primarily with the chemical industry, the tensile and creep properties and resistance to corrosion at high temperatures of various alloys are becoming of increasing importance with the general tendency to adopt higher temperatures for such purposes as electricity generating plant. The four alloys tested were low and medium carbon 1 per cent chromium-molybdenum steel, low-carbon 3 per cent chromium-molybdenum steel and 18/10 Mo/Ti chromium-nickel austenitic steel.

# VIEWS on the NEWS

*By REFLECTOR*

IN the early days of nationalisation and in years when there was controversy over what some people considered the disproportionate amount of capital allocated to the electricity supply industry, the Press conference on the Central Electricity Authority's annual report was a lively affair and the boardroom at Winsley Street was crowded. At each succeeding conference Lord Citrine displayed increasing skill in answering, and where necessary parrying, the relays of awkward questions, and he also showed great patience in explaining obscure points to the many non-technical journalists. Last week the attendance was for some reason relatively small and although Sir Henry Self was no doubt gratified at the calm way in which the report of the change-over year was accepted he seemed to be slightly disappointed at not being called to show his ability to deal with a difficult situation. Most of the questions concerned the extent to which the Area Boards would pass on the recently announced reduction in the running charge. But since the Boards are now autonomous, Sir Henry could not answer and was obliged, as he said, to give the impression of stalling. This is an unfortunate, and perhaps unforeseen, aspect of the new set-up, and I hope that some way may be found by next year for providing answers to questions on the affairs of the Area Boards generally, in addition to the local Press conferences held by the Board chairmen.

* * *

A week or two ago I commended the ingenuity of those who had the job of naming nuclear reactors. They have, I find, their counterparts in the General Post Office. Having evolved the term electronic random number indicating equipment, "ERNIE" for short, they have turned their attention to letter sorting and have produced "ALF" (automatic letter facer) which turns letters the right way up for stamp cancellation and "ELSIE" (electronic sorting indication equipment) who is said to be replacing men in the accurate pigeon-holing of letters in the sorting office.

* * *

Although the basic idea of an electrically powered tractor is not new, I was interested in the description of the 30 h.p. prototype tractor plough, reported in last week's *Electrical Review*. The size of the tractor suggests that it would be used only on large farms and this would probably necessitate more than one supply point. The manufacturers state that the three-phase supply is to be drawn from the grid through a transformer. I assume that in this context, the term "grid" was not used in the generally accepted sense, but the cost of a number of permanent supply points even at, say, 11 kV, with appropriate switchgear would be rather heavy. As this development originates in Scotland, perhaps it is intended to operate the tractor from one of the small hydro-electric power stations which would, thus, admirably fulfil the function of the North of Scotland Hydro-Electric Board to bring power to the glen. The makers state that the significance of an electrically powered plough is in the event of a shortage of fuel oil due, for example, to a war. If such a disastrous shortage occurs, it may, perhaps, be simpler to return to the horse-drawn plough and leave fossil fuel and electrical energy to the many other vital jobs which require more "horse power."

* * *

Bridgwater (Somerset) Town Council is protesting to the Prime Minister against the Government's decision to employ the Hinkley Point nuclear power station for the production of plutonium for military purposes, when it was originally intended to produce power only, for peaceful purposes. This is probably an example of justification for the wrong reason. What is of more immediate interest is the effect of the decision upon the efficiency of the station as a power producer, a point which in spite of the Government's assurances is by no means settled.

* * *

Commenting on the controversy aroused by the Central Electricity Generating Board's proposal to erect a transmission line across the Esher commons, the *Surrey Comet* puts the matter in a new light when it says:—

> "Since pylons must come, on the ground of cheapness alone if on no other, it is better that they should go across the public property of commons so that all share the disadvantage (if it is that) than that they should affect private property by casting their shadows over some houses and thus penalise a few individuals."

Whether this way of looking at it would appeal to the Council for the Preservation of Rural England is a little doubtful.

* * *

With the Shop Lighting Campaign now in progress it is opportune to recall shop lighting ideas of half a century ago. In its issue of 2nd October, 1908, the *Electrical Review* reported a paper presented by a Mr. George Loring at an electrical contractors' convention in Chicago. Part of the report read as follows:—

> "For shop lighting Mr. Loring believes emphatically in the use of the tungsten lamp. He says, 'If a person is already using electric light in his place of business, advise, with few exceptions, the use of tungsten lamps over all other illuminants. Provided the installation is as efficient as possible with cellulose-filament lamps, replace three 16-C.P. cellulose-filament (carbon) lamps by two 40-watt tungsten lamps.'"

The author then went into comparative costs to show the saving this made and then, among other points, said:

> "It is preferable to arrange that one tungsten lamp and shade constitutes a lighting unit in a scheme of shop illumination, in preference to having clusters, in order to avoid uneven illumination. Four lamps properly placed will frequently give better results than five or six installed in a cluster."

# I.E.E. SUB-CENTRE CHAIRMEN

## OFFICERS FOR THE 1958-59 SESSION

MANY of the Sub-Centres of the Institution of Electrical Engineers have a membership comparable with the main Centres, and the past chairmen have included men well known in the electrical industry. In the following biographical notes we give brief particulars of some of the chairmen for the 1958-59 Session. We hope to publish similar details of the remaining chairmen in a subsequent issue.

**Mr. R. A. W. Connor,** M.I.E.E. (East Anglian), is assistant chief engineer (technical) of the Eastern Electricity Board. He was educated at the Military School and at the Aeronautical and Technical Schools, Farnborough. In 1924 he commenced his training as an improver at the central electric power station, Aldershot. From 1927 to 1932 he was with the Worcester Corporation Electricity Department and from 1932 to 1942 with the Battersea Electricity Department. In the last-mentioned year he was appointed technical and constructional engineer with the Luton electricity undertaking, which position he held until taking up his present appointment in 1948.

Mr. Connor is the author of a number of technical articles and in 1942 he was awarded the I.E.E. John Hopkinson Premium for his paper "The Effect of the National Grid on the Operation and Maintenance of Secondary Power Stations."

**Mr. L. F. Robson,** B.A., A.M.I.E.E. (Tees-Side), is sub-area commercial officer of the Tees Sub-Area of the North Eastern Electricity Board. He received his education at Cambridge University and in 1937 became a student engineer with the North Eastern Electric Supply Co., Ltd. During the last war he served with the Royal Corps of Signals, mainly in India and the Middle East. He returned to the North Eastern Electric Supply Co. in 1946 and on nationalisation in 1948, was appointed to the Chief Commercial Officer's Department of the North Eastern Electricity Board. He took up his present appointment in 1956.

**Mr. R. W. Palmer,** M.I.E.E. (North Staffordshire), has been Principal of the Central Training School of the G.P.O. Engineering Department, Stone, Staffs., since 1954. He received his education at King's College School, Wimbledon, and the Northampton Polytechnic, London, and his training with Ferranti, Ltd., and the G.P.O. He entered the Post Office as youth-in-training in 1923 and was transferred to the P.O. Research Station, Dollis Hill, where he spent eight years on experimental work in the circuit laboratory on automatic telephone exchanges. For a number of years he was engaged on telephone exchange equipment design and specifications (he designed the first mobile automatic exchange in 1938), and on automatic exchange maintenance, culminating in visits to Sweden and Norway in 1952 as assistant staff engineer, and a special assignment to the United States in 1953 as leader of an Anglo-American Productivity Team on maintenance efficiency. Mr. Palmer was chief examiner in telephony for the City and Guilds College from 1943 to 1946 and was vice-chairman of the Institution of Post Office Electrical Engineers, Stone/Stoke Centre, from 1955 to 1958. In 1955 he was awarded the Llewelyn B. Atkinson Premium for his I.E.E. paper on "Maintenance Principles for Automatic Telephone Exchange Plant."

Mr. R. A. W. Connor

Mr. L. F. Robson

Mr. R. W. Palmer

**Captain W. W. H. Ash,** Wh.Sch., M.I.E.E., A.D.C., R.N. (South Western), is electrical engineering manager at H.M. Dockyard, Devonport. His education was received at the City and Guilds College and the Royal Naval College, Greenwich. In 1932 he was appointed assistant electrical engineer (submarine design), Admiralty, and in 1937 became electrical engineer (battleship design). He was appointed fleet electrical engineer on the staff of the Commander-in-Chief, Mediterranean, in 1939, and from 1941 to 1945 was superintending electrical engineer (supply and production), Admiralty. For the next three years he was superintending electrical engineer at H.M. Dockyard, Hong Kong, and in 1948 was appointed superintending electrical engineer at the Admiralty Engineering Laboratory. This was followed by a period (1950-51) as commander R.N. in H.M.S. *Montclare* and then as captain R.N. (weapon control design), Admiralty (1951-54). He took up his present appointment at Devonport in 1954.

Capt. W. W. H. Ash

Mr. T. Gill

**Mr. T. Gill,** B.Sc., A.M.I.E.E. (West Wales (Swansea)), has spent the whole of his career with the Metropolitan-Vickers Electrical Co., Ltd., and he is now manager of the company's Swansea sub-office. His education was received at Burnley Grammar School and Victoria University, Manchester, where he graduated with first class honours in electrical engineering in 1925. Following a two years' college apprenticeship with the Metropolitan-Vickers Electrical Co., he was appointed as technical assistant in the company's Motor Sales Department and in 1930 was transferred to the Glasgow office where he was engaged on change-of-frequency work until 1932 when he joined the company's Cardiff office. He took over the managership of the Swansea office in 1952. Mr. Gill has been assistant hon. secretary and chairman of the I.E.E. Western Centre Utilisation Group, and assistant hon. secretary of the Western Centre. He is a past chairman of the Association of Mining Electrical and Mechanical Engineers.

# PERSONAL AND SOCIAL

## *News of Men and Women of the Industry*

**Dr. H. I. Andrews,** M.Sc., M.I.Mech.E., M.I.E.E., general assistant in the Electrical Engineering Department of the British Transport Commission, has been appointed assistant electric traction engineer (research) with the Commission. Dr. Andrews studied railway engineering at the City and Guilds College, London, under Professor W. E. Dalby and later at the University of Illinois. After working as a pupil on the New York, New Haven, and Hartford Rail-Road, he returned to England to work on electric traction with the English Electric Co., Ltd., and subsequently on diesel-electric traction for Sir W. G. Armstrong Whitworth & Co. In 1934 he joined the Engineering Section of the L.M.S.R. Research Department, and in 1951 became general assistant in the Electrical Engineering New Works and Development Section of the Railway Executive at Liverpool Street. Dr. Andrews is the author of several publications on railway technical subjects and has been awarded the George Stephenson Prize by the Institution of Mechanical Engineers, the Kelvin Premium by the Institution of Electrical Engineers, and the Lightfoot Medal by the Institute of Refrigeration.

Three senior officers of the East Midlands Electricity Board retired on 30th September. They are **Mr. F. R. C. Roberts,** M.I.E.E., manager of the Spalding District; **Mr. F. S. Bird,** secretary of the Derby and Burton Sub-Area; and **Mr. G. A. Adams,** commercial officer, Burton District. In addition, **Mr. S. Dawson,** A.M.I.E.E., A.M.I.Mech.E., who is at present labour relations officer, East Midlands Area, has been appointed assistant secretary (personnel) with effect from 1st November.

*Mr. F. R. C. Roberts*

*Mr. F. S. Bird*

*Mr. G. A. Adams*

*Mr. S. Dawson*

Mr. Roberts has completed fifty years' service in the electricity supply industry. After completing his education at the Harris Technical Institute, Preston, he joined the Fleetwood Electric Light & Power Co. in 1908. Six years later he joined the Cleveland & Durham Electric Power Co. and in 1916 he took up an appointment as assistant district engineer with the Newcastle Electricity Supply Co. Mr. Roberts went to Spalding in 1928 as electrical engineer to the U.D.C. and on vesting date became manager of the Spalding District.

Mr. Bird joined the Burton Corporation Electricity Department in 1913 and was appointed chief clerk in 1935. He became secretary/accountant to the Burton and District Sub-Area of the Board in 1948, and secretary of the combined Derby and Burton Sub-Area when it was formed in 1951.

Mr. Adams has been in the electricity supply industry for fifty-four years, joining the Burton electricity and tramways undertaking at the age of fourteen and rising to chief commercial assistant. He became commercial officer for the Burton and District Sub-Area in 1948.

Mr. Dawson, on leaving Sheffield University, joined the Sheffield Corporation transport undertaking in 1924 and went to the Leicester Corporation transport undertaking in 1936. In 1946 he joined the National and Local Government Officers' Association and he took up his present appointment as labour relations officer for the East Midlands Area of the E.M.E.B. in 1948.

**Mr. R. J. Gresley,** A.M.I.E.E., has been appointed chief engineer of the Power and Distribution Transformer Division of the Gresham Transformer Group. Mr. Gresley was educated at Denbigh Grammar School, North Wales, and was apprenticed to Ferranti, Ltd. In 1943 he joined the Royal Air Force, serving as an engineer officer. He returned to Ferranti as a transformer designer, specialising in distribution transformer design up to 1,000 kVA. From 1953 to 1957 he was chief engineer in the Distribution Transformer Department and then transferred to the Power Transformer Department where he remained until joining Gresham Transformers, Ltd., in July last.

**Mr. A. L. Ball** has resigned from the board of Ultra Electric (Holdings), Ltd., and **Mr. A. V. Edwards** has been appointed to the board. Mr. Edwards will continue to be secretary of the company. Mr. Ball has also resigned from the board of Ultra Electric, Ltd., and **Sir Victor Tait** has been appointed a director. **Mr. J. Irving** replaces Mr. Edwards as secretary of the company.

**Mr. J. B. Jackson,** M.I.Mech.E., M.I.E.E., has been appointed divisional controller of the North Eastern Division of the Central Electricity Generating Board. After obtaining a diploma in mechanical engineering at Sunderland Technical College, Mr. Jackson served a five year apprenticeship with the North Eastern Marine Engineering Co., Ltd., followed by three years as a student engineer with the Newcastle Electric Supply Co., Ltd. In 1932 he became assistant engineer, Construction Department (Mechanical and Civil), and in 1935 was assistant engineer, Economy Section. From 1938 to 1946 he held the position of personal assistant to the generation engineer, and in 1946 became generation engineer. In 1948 he was appointed chief generation engineer (operation) in the North Eastern Division, the post he now vacates to take up his new appointment.

*Mr. J. B. Jackson*

Heavy rain marred the finals of the **Electrical Industries National Golf Championship,** which were played off at Wentworth Golf Club, Virginia Water, on 29th September, and as a result some rather poor scores were returned. The annual dinner, however, which was held in the evening at Park Lane Hotel, London, was a great success. Lord Chandos was in the chair, and the toast of "The Electrical Industries National Golf Championship" was proposed by Lord Brabazon. In reply Lord Chandos paid tribute to the work of Mr. Ernest Mills and Mr. Leslie Welch, the organisers. He said that, as a result of the Championship, £750 had been raised for the Electrical Industries Benevolent Association. The prizes were then presented, the winners being as follows:—Sir Montague Hughman Trophy, Mr. S. Griffith (London); runner-up (J. L. Wilson Cup), Mr. J. L. Taylor (Leighton Buzzard). Best scratch score (J. Y. Fletcher Cup), Mr. L. G. Chittenden (Southsea). Foursomes trophies (presented by Sir Felix Pole), Messrs. E. Barclay (Sharples, Bolton) and Mr. R. C. Bowker (Bolton); runners-up, Messrs. L. G. Chittenden (Southsea) and J. Mills (Swaythling, Southampton). Visitors' Trophy (presented by

the Electrical Wholesalers' Federation), Mr. A. H. Welch (London); runner-up, Mr. H. Lockett (Slough). Veterans' Trophy (presented by the *Electrical Journal*), Mr. F. C. Kilburn (London). Following the presentations the toast of "The Electrical Industries Benevolent Association" was proposed by Sir Henry Self, and Mr. C. R. King responded.

The Electricity Council has appointed **Mr. M. Skinner,** B.Com., assistant to the secretary of the National Joint Advisory Council, to be joint consultation officer in the Council's Industrial Relations Department.

**Mr. H. G. Allen,** director of Falk, Stadelmann & Co., Ltd., is visiting the United States during this month in connection with the company's American interests.

With effect from Monday next the manager of the Crompton Parkinson Cardiff branch, Plant Division, will be **Mr. C. E. Hucker.** He joined Crompton Parkinson in 1948 and since then has been employed as a sales engineer in the Bristol area. After enlisting in the Royal Armoured Corps at the outbreak of war in 1939, Mr. Hucker joined R.E.M.E. at its inception in 1943, attaining the rank of captain.

*Mr. C. E. Hucker*

E. K. Cole, Ltd., announces a reorganisation of its Heating Sales Department to meet the increase in business resulting from the introduction of new models and the recent addition of radiant fires and electric blankets to its range of equipment. The Sales Department will now operate in two sections, one being responsible for technical sales and contracts under the supervision of **Mr. G. R. Wibrow,** who has been with the Heating Department for many years. The other section will handle general sales, under the supervision of **Mr. J. E. Woodward,** O.B.E., who has recently joined Ekco Heating from H. J. Frost & Co. The Ekco Heating Division is under the managership of **Mr. C. B. Cleland** who, with Mr. Wibrow and Mr. Woodward, is at the company's London office, 5, Vigo Street, W.1. At Southend **Mr. R. P. Johnson** is responsible for the sales order office and works liaison.

*Mr. G. R. Wibrow*

*Mr. J. E. Woodward*

**Mr. J. Hodkinson** has been appointed a director of Wickman, Ltd., with overall responsibility for the company's machine tools export interests. He will retain his present appointment as managing director of Machine Tools (India) Private, Ltd. (a Wickman associated company), which he assumed upon joining that company in June, 1954. Before joining Wickman, Ltd., Mr. Hodkinson had held appointments with the Associated British Machine Tool Manufacturers' Indian company and Craven Bros. (Manchester), Ltd. During the war he was Deputy Director-General (Tools), and Machine Tools Controller with the Government of India.

*Mr. J. Hodkinson*

The **British Central Electrical Co., Ltd.,** held its ninth electrical engineering exhibition and reception at the Grosvenor House Hotel, Park Lane, London, on 26th September. The occasion was also a golden jubilee celebration, the company having been established in 1908. Nearly 400 guests were received by the managing director, Mr. G. Conradi, A.M.I.E.E., and Mrs. Conradi, who during the evening cut a golden jubilee cake. The exhibition was arranged in co-operation with the A.E.I. Lamp & Lighting Co., Ltd., Aidas Electric, Ltd., Cayson Electrics, Ltd., Chilton Electric Products, Ltd., Dexion, Ltd., Standard Telephones & Cables, Ltd., in addition to the B.C.E. exhibits. In welcoming the guests, Mr. Conradi referred to the early history of the company, and paid tribute to Mr. C. G. Marks, the company's secretary and general manager, who had made the preparations for the exhibition. A cabaret was provided by Mr. Gate Eastley and the "Gay Timers," and the evening terminated with dancing.

Under the reorganisation of the Admiralty's Materials Departments, **Sir Hamish D. MacLaren,** K.B.E., C.B., D.F.C., has been appointed Director of the Electrical Engineering Division.

The next production of the **Portland Players** (Electricity Council and Central Electricity Generating Board) will be Terence Rattigan's "Separate Tables," which will be given at the King George's Hall, Adeline Place, Great Russell Street, London, W.C.1, on 10th and 11th November.

Vactric, Ltd., announces that in connection with the recent sale of the Awley Finance Co., Ltd., to Lombard Banking, Ltd., it has been agreed between all the parties concerned that **Mr. J. C. Raisbeck,** managing director of the Awley Finance Co., Ltd., shall give up his directorship of Vactric, Ltd., in order to concentrate on the expansion of Awley's business.

It is difficult to imagine a man and wife living together for twenty-five years, each having their own intrigues, and still more so when the wife chooses the twenty-fifth anniversary of their wedding to announce that she is leaving her husband for another man, but this forms the basis of the comedy "Silver Wedding," by Michael Clayton Hutton, which the **G.E.C. Dramatic Society** presented at the Cripplegate Theatre on Tuesday and Wednesday last week. However impossible the situation, the play is full of wit and is first-rate entertainment. Mary Andrew's interpretation of Lady Marlowe, the wife (a long part), was good to watch and Anna Powell gave a delightful performance as the Dowager Lady Charlton (her mother). Laurie White, as the philandering husband, was convincing, and Gillian Champion's appearance as Stella Manners, his latest "affair," was all too brief. Mention should also be made of Shirley Linge, as Diane Marlowe, and Derek Coleman, as Simon Marlowe (daughter and son), who completed a cast all of whom made the most of their lines. A donation from the proceeds of the production is to be given to the Royal Commercial Travellers' Schools.

**Mr. J. Vaughan Harries,** district manager of the Brush Electrical Engineering Co., Ltd., Cardiff, was installed as president of the Publicity Club of Cardiff on 23rd September.

**Mr. R. W. Jelbart,** T.D., has been appointed sales manager of the Thermostat Division of R. B. Pullin & Co., Ltd. Mr. Jelbart was formerly London sales manager of Aga Heat, Ltd.

*Mr. R. W. Jelbart*

**Mr. A. E. Bird,** lamp and lighting service engineer with A.E.I. Lamp & Lighting Co., Ltd., Leicester, was installed as chairman of the Leicester Centre of the Illuminating Engineering Society on 29th September.

**Mr. R. S. Underwood** retired on 30th September from E. K. Cole, Ltd., after twenty-six years' service. For many years he was responsible for Ekco southern area radio sales and was latterly assistant radio sales manager. With his wife, Mr. Underwood will be leaving this country shortly for South Africa, where his daughter has been resident in Johannesburg for some years.

**Mr. Z. Cetnarowicz,** B.Sc.(Eng.) (Hons.), Graduate I.E.E., has joined the Watford Electric & Manufacturing

Co., Ltd., as senior assistant to the research director of the company's research and development laboratory. He was until recently with the Electrical Research Association where he was concerned with contactor and fuse investigation.

Crompton Parkinson, Ltd., announce that, due to the growth of their industrial motor business, **Mr. P. D. Osborn,** B.Sc.(Eng.), A.M.I.E.E., will assume complete responsibility for the sale of motors produced at the Guiseley factory. He will continue to represent the company in trade association matters. **Mr. C. J. Teasdel** has been appointed product sales manager, Chelmsford Machines, which covers

*Mr. P. D. Osborn*

*Mr. C. J. Teasdel*

large motors, d.c. marine motors, generators and alternators. He was formerly branch manager, Home Counties, and has been associated with Crompton Parkinson for nearly thirty years.

**Mr. J. W. C. Milligan,** managing director of the Southern Areas Electric Corporation, Ltd., left London on 5th October for a five-week tour of North America, during which he will visit Montreal, Ottawa, Toronto, Hamilton, St. Catherine's, Pittsburg, Boston and New York.

**Mr. B. D. Bowman,** B.Sc.Eng., A.M.I.Mech.E., is joining Metaducts, Ltd., as technical sales manager. He takes up the appointment on 20th October.

**Mr. J. C. King** has recently resigned his position as home sales manager of the Rheostatic Co., Ltd., and has joined the Fuel Efficiency Co., Ltd.

**Mr. D. P. Howson,** B.Sc.(Bristol), has been appointed lecturer in electrical engineering in Birmingham University.

**Mr. F. V. Waller,** M.I.P.E., has accepted an invitation to join the board of the Southern Areas Electric Corporation, Ltd.

This year's **Electrical Industries Ball** in aid of the funds of the Electrical Industries Benevolent Association is being held at Grosvenor House, Park Lane, London, W.1, on Friday, 14th November. It will begin with a dinner (7 for 7.30 p.m.) and continue until 2 a.m. There will be the usual midnight cabaret show. Tickets are obtainable at 3 guineas each (including dinner) from the Association at 10, Buckingham Palace Gardens, London, S.W.1, and applications and table reservations should be made at once.

## OBITUARY

**Mr. Eric Maurice Johnson,** M.Sc.Tech., M.I.E.E. formerly consultant to the chief electrical engineer of the Metropolitan-Vickers Electrical Co., Ltd., and previously chief engineer of the company's Plant Department, died on 3rd October at the age of sixty-seven. Mr. Johnson studied electrical engineering at the Manchester College of Technology and became a college apprentice with the British Westinghouse Co., later holding positions in Germany and Switzerland. His association with the Metropolitan-Vickers Co. commenced in 1920 and he was associated with various branches of the company's engineering work. He was for some time in charge of its electrical ship propulsion activities and was for a number of years responsible for the design of large water-wheel alternators, synchronous condensers and other salient-pole machines. Mr. Johnson was appointed chief engineer of the M.-V. Plant Department in 1946, relinquishing that position in 1955 on becoming consultant to the chief electrical engineer of the company.

**Mr. Philip Bradford Niles,** a vice-president and a director of the Yale & Towne Manufacturing Co., died in the Lenox Hill Hospital, New York, on 24th September at the age of fifty-six.

**Mr. F. A. Spence-Brown,** a joint managing director of Johnson, Matthey & Co., Ltd., died suddenly on 29th September.

## WILLS

**Mr. G. B. Hayward,** M.B.E., A.M.I.E.E., assistant manager of the Athens Piraeus Electricity Co., who died on 13th May last, left estate in Great Britain valued at £19,407 gross (£19,405 net).

**Mr. E. P. S. Cattle,** A.M.I.E.E., a director of Higgins and Cattle, Ltd., electrical contractors, who died on 8th May last, left £27,278 gross (£27,056 net).

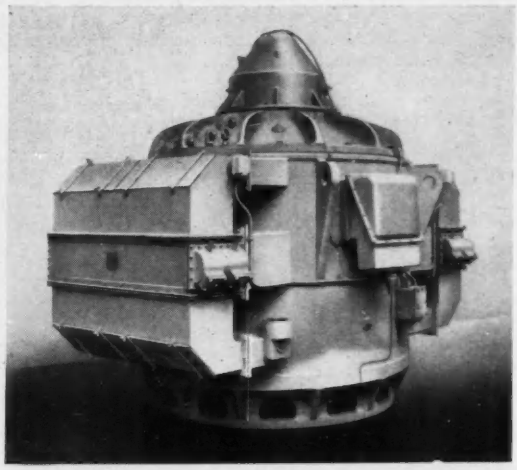
**Mr. W. H. Walton,** founder and chairman of Pinching and Walton, Ltd., who died on 23rd May last, left £70,823 gross (£70,314 net).

**Mr. C. W. Johnson,** formerly of the Rangoon Electric Tramway & Supply Co., who died on 30th May last, left estate in Great Britain valued at £46,329 gross (£46,185 net).

## *Power Station Auxiliary Drives*

IN our last issue we published an article describing the Ferrybridge "B" generating station of the Central Electricity Generating Board. On page 609 we illustrated two of the six cooling water pumps the driving motors for which were supplied by Laurence, Scott & Electromotors, Ltd. There are three 900 h.p., 490 r.p.m. and three 1,300 h.p., 425 r.p.m. motors, all weatherproof type with air/water heat exchangers. They are "Trislot" high-torque low-current squirrel-cage machines, to minimise starting current. These motors are representative of a marked trend towards the use of outdoor or semi-outdoor motors for power stations, pumping stations and similar applications, to reduce building costs. The motors need not have water cooling; in the case of the i.d. fan motors at Willingdon "A" power station, for example (N-S variable-speed motors of 860/57 h.p. at 790/316 r.p.m.), air/air heat exchangers are employed.

The use of water coolers is sometimes regarded with disfavour because of the possibility of failure of the water supply (although precautions may be taken to prevent damage to the motor under such conditions). In this connection, the accompanying illustration is of a 1,250 h.p., 595 r.p.m. "Trislot" motor for Boundary Dam power station, Canada, which is fitted with flaps on the air circuit trunkings so that in the event of failure of the cooling water supply emergency operation as a normal ventilated machine would be possible.



*1,250 h.p., 595 r.p.m. "Trislot" motor for Boundary Dam power station, Canada*

# Letter to the Editor

*Letters should bear the writers' names and addresses not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.*

## Space Heating

YOUR editorial under the above heading is timely. As you so rightly say:—

> "During the several years before the war a very serious effort was made throughout various sections of the electrical industry to break away from the high-temperature electric space heater in favour of low-temperature heating. This was mainly because it was felt by many that the high-temperature heater was limiting the use of electricity for space heating to intermittent heating which was against the wider interests of electricity supply and indeed of the electrical industry as a whole."

To-day we know a lot more about methods of continuous space heating and we can look at the experience of the Scandinavians and the Americans who have tried out many different types of heating. There are many new electric space heating appliances available. The importance of the correct siting and the design of the heat emitter are better understood. The study of comfort and methods of heating to achieve a high standard of comfort have been tried out and it has been found that the best position to site the heat emitter is under the window and to full window width; nine-tenths of the heat emitters in Europe are in the form of low-temperature hot water radiators, either panel or column.

We know from experience that the electrical industry can offer the exact electrical equivalent of a well-designed hot water central heating system with certain additional advantages. Oil-filled electric radiators can be tailored to full window width; they can be supplied in an infinite variety of lengths.

So far as cost of running is concerned, a completely electrically central heated home, using low-temperature radiators, will use an average of about 1,000 kWh per kilowatt installed each winter. This is considerably less than with, for example, electric floor heating. The actual cost on normal tariffs, if the occupants are out a lot, can be less than with an ordinary oil-fired system.

We have in the past appealed for field tests to be conducted, comparing one form of low-temperature electric heating with other forms of electric heating, and we hope that your editorial will bring this question of continuous electric space heating to the fore.

*London, W.1.*

A. C. HAZEL,
*Managing Director,*
Hurseal, Ltd.

---

# South African News

From Our Cape Town Correspondent

THE South African Federated Chamber of Industries has been informed by the Minister of Economic Affairs that he has agreed in principle to declare compulsory safety specifications for household electrical appliances sold generally in South Africa. Equipment covered by the specifications includes stoves and hotplates, portable immersion heaters, air heaters and radiators, portable appliances for heating liquids, headlamps, flexible cords for power and lighting, plugs, socket outlets and socket outlet adaptors, lampholders and bayonet lampholder adaptors, and connectors for portable appliances. It is intended that the scheme shall be financed by a levy to be paid by manufacturers and importers, and that the South African Bureau of Standards shall be responsible for the administration of the compulsory specification. The Director of the South African Bureau of Standards said that the proposed safety specifications had been submitted to the Minister for promulgation and the matter was now in his hands for final decision. If the proposed control measures were introduced to ensure certain basic safety features in electrical appliances and equipment, South Africa would be falling into line with the practice already operating in many other countries.

The Cape Town Electricity Committee has for some time been perturbed by the fact that whenever tenders are invited for the supply of certain electrical equipment, most of the firms tendering quote exactly the same prices. This matter has also received the attention of the Association of Municipal Electricity Undertakings of Southern Africa, and at this year's convention of the Association it was suggested that a conference of all interested bodies be called to discuss level price tendering. Cape Town City Council has now decided to convene a meeting of representatives of all the municipalities of the Union who operate their own electricity undertakings, as well as the Electricity Supply Commission, to discuss ways and means of overcoming the practice of price fixing by tenderers for electrical equipment.

Extensions are to be made to the Hex River power station at Worcester, Cape, to deal with the electrification of the railway line from Touws River to Beaufort West. Much of the preliminary work in connection with this project has already been completed. The Electricity Supply Commission is expected to import a 30 MW turbo-generator for the Hex River station.

---

## A.S.E.E. Presidential Address

AT the meeting of the Association of Supervising Electrical Engineers to be held in the lecture theatre of the Institution of Electrical Engineers on Tuesday, 21st October, Sir Josiah Eccles will be installed as president and will deliver his presidential address. The address will deal with some impressions of the Association's various activities and will review the growth of the electricity supply industry in this country. The meeting will commence at 6.30 p.m., light refreshments being served from 6 p.m. Early application should be made for the limited number of tickets available for visitors (including ladies) to the General Secretary, Association of Supervising Electrical Engineers, 23, Bloomsbury Square, London, W.C.1.

---

## Transistor Convention

THE International Convention on Transistors and Associated Semi-Conductor Devices, planned by the Radio and Telecommunication Section of the Institution of Electrical Engineers, to be held from 25th to 29th May, 1959, will have two features which represent a change from normal I.E.E. practice. Firstly it will be held at Earls Court instead of in the Institution building and secondly, it will be accompanied by an international exhibition covering all aspects of transistor and semi-conductor devices.

The occasion illustrates the unique position of London as a natural world centre for the exchange of scientific information. Electronics experts from many countries, including the United States and Russia, have been invited. The convention will provide an opportunity for exchanges on the common ground of science between all the participants.

At Earls Court, Hall D will house the exhibition and the Warwick and Richmond Halls will be used for the convention meetings. The exhibition, which is being promoted by the Institution, is being arranged by Industrial & Trade Fairs, Ltd., Drury House, Russell Street, W.C.2 (Temple Bar 3422), and inquiries from those interested in exhibiting should be addressed to this organisation.

# INDUSTRIAL NEWS

## Power Convention Exhibition

The Council of the British Electrical Power Convention has decided that an electrical exhibition shall be held in conjunction with next year's Convention at Torquay (1st to 5th June) and has invited the British Electrical Development Association to organise an exhibition. Early application for space should be made to the Director and Secretary, E.D.A., 2, Savoy Hill, London, W.C.2.

In anticipation of the B.E.P.C. Council's decision several applications have already been made to E.D.A. by firms that have not previously shown at the Convention exhibition. Negotiations for a suitable site for the exhibition are proceeding.

## Restrictive Practices Court

On Monday the Restrictive Trade Practices Court started to hear its first case since it was set up two years ago under the Restrictive Trade Practices Act, 1956. The case concerns an agreement between the members of the Chemists Federation and it will be followed in about three weeks by the second of the 40-odd cases that have so far been prepared for hearing by the Court. It is understood that no date has yet been fixed for the hearing of any of the cases involving agreements between electrical manufacturers.

## Engineering Wages Increased

Last week the engineering employers offered and the trade unions accepted an increase in wages amounting to approximately 4 per cent. The increase is 7s 4d a week for skilled men, 6s 8d for semi-skilled and 6s for unskilled. There was no stipulation that there should be a "standstill" period as there was on the occasion of the last increase. Higher pay for holidays is to be the subject of further discussions.

On the following day it was announced that agreement had been reached on the subject of wages of women in the industry. For some time the trade unions have been pressing for equality of wages of men and women, but the employers' offer of an increase of 5s 6d a week in the basic rate of women over 18 years of age, making it £6 6s 6d, was accepted.

## Abnormal Indivisible Loads

A plea to make the country's new motorways available to special-type vehicles carrying what are known as "abnormal indivisible loads" is made by Mr. F. D. Fitz-Gerald, national secretary of the Traders' Road Transport Association, the organisation for "C" licence operators, in an article in the Association's monthly *Bulletin*. He says it is to be hoped that the Minister of Transport will enable the new Preston motorway to be used as much as possible by such traffic and that the experiment which the Minister has authorised will satisfy him that abnormal load traffic should normally be permitted to use motorways. This type of traffic could not otherwise be transported; more often than not it had to travel on roundabout routes to avoid weak, narrow or low bridges and so on.

## Igranic "Open" Day

There were over 7,000 visitors at the "open" day of the Igranic Electric Co., Ltd. (the first since 1950), which was held on Saturday last at the company's Bedford works. The visitors included employees' friends and relations, the guests of the management, including directors of the Metal Industries Group of which the Igranic Co. is a member, civic dignitaries and parties of school children. More than 100 staff and employees acted as guides on an extended tour of the works, which covered the boiler house, the recently rebuilt research and development building with its workshops and laboratories in which life tests of new products and developments are carried out, the various production departments, the spraying shop, the machine shop and the four assembly shops.

In one of the assembly shops heavy control panels up to 10ft high by 50ft long were being assembled or tested, as well as enclosed multi-motor control boards. In the second shop, smaller switchboards and panels, and associated sub-assemblies, were being made up ready for moving into the test bay. The third assembly room is devoted to smaller items, such as auxiliary switches, and the fourth, small starters, in which also urgent rush jobs are carried out. Among the items seen were flash testing of contactor equipment up to 60 kV, a new boring mill for close tolerance machining of circular castings, and the testing of lifting magnets.

Actual orders in various stages of production included control systems designed in conjunction with the manufacturers of the plant. These included a magnetic-amplifier tension control equipment for a new steel strapping line; a control panel for orebridge and unloader equipment for a blast furnace in an Australian steelworks; a composite control switchboard for a sewage station in Wiltshire; and a control desk for the bridge of a new dredger and an enclosed switchboard with marine finish for controlling the motors associated with the dredging equipment.

## British Lighting Council

A meeting to inaugurate the activities of the British Lighting Council in the South-West was held in Bristol on 30th September. This was the first of three or four such meetings, the others to be in Cardiff, Plymouth, Taunton, and possibly one other centre. Mr. W. J. Guscott, chairman of the Regional Committee of B.L.C. based in Bristol, was in the chair, and the audience, which numbered some 150, including architects, consulting engineers, electrical contractors, wholesalers, works managers, and representatives of B.L.C. members, was welcomed by Mr. E. C. Willis, deputy chairman of the South Western Electricity Board. Mr. W. T. Souter, a vice-chairman of the Council, explained the aims and objects of the Council, and an illustrated survey, under the title "Better Lighting," was given by Mr. E. B. Sawyer, secretary of the Council.

There were 150 electrical contractors, wholesalers, representatives of M.A.N.W.E.B. and others in the

*Mr. E. B. Sawyer giving a demonstration at the meeting to inaugurate the activities of the British Lighting Council in the South-West. With him are (left to right) Mr. W. J. Guscott (chairman of the South-Western Centre and assistant chief commercial officer (development), South Western Electricity Board), Mr. E. C. Willis (deputy chairman, South Western Electricity Board) and Mr. W. T. Souter, vice-chairman of the Council*

electrical trade at a conference held by the British Lighting Council in Liverpool on 1st October to inaugurate the shop lighting campaign. Mr. A. Wilcock (B.L.C.) said that a survey in 75 towns in the North-West, covering about 1,371 shops, showed that the average lighting was 78 W per foot length of window, making allowances for developments such as fluorescent lighting. Before the war the average figure was 100 W per running foot of window. Only 42 out of every 100 shops had after-hour lighting. There was wide scope for the improvement of shop lighting. Mr. G. L. Butler, who presided, pointed out that the campaign could increase the size of the market for electric lamps and fittings. He urged members to attend the "selling lighting" lecture course. Similar conferences have been held at Manchester and Preston.

## Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

| | |
|---|---|
| ALUMINIUM ingots | ton £180 0s 0d |
| COPPER, H.C. Electro | ton £219 5s 0d |
| Fire Refined 99·70% | ton £218 0s 0d |
| Fire Refined 99·50% | ton £217 0s 0d |
| COPPER Tubes .. | lb 2s 1½d |
| Sheet .. .. .. | ton £245 4s 0d |
| H.C. wire and strip .. | ton £266 15s 0d |
| LEAD, English .. | ton £73 5s 0d |
| Foreign .. .. | ton £72 0s 0d |
| MERCURY .. .. | flask £79 0s 0d |
| TIN, block (English) .. | ton £740 0s 0d |
| ZINC, G.O.B. Foreign | ton £66 15s 0d |
| BRASS Tubes (solid drawn) .. .. | lb 1s 8½d |
| Wire .. .. .. | lb 2s 6d |
| PHOSPHOR BRONZE Wire .. .. .. | lb 3s 10½d |
| PLATINUM .. .. | oz £21 5s 0d |
| RUBBER, No. 1 R.S.S. spot .. .. .. | lb 24½d—24¾d |

## Novel Window Display

The accompanying picture of a window display at the Sunderland Service Centre shows how an electrical display can be so arranged as to arrest the attention of passers-by. The electrical section shows an old electric cooker, with a notice reading "Retired Veteran 1928-58. After Continuous Use," beside a modern Jackson 396 eye-level grill cooker. The other half of the window displays figures in military uniforms and the caption "The uniform changes but the spirit remains the same."

*An arresting cooker window display at Sunderland Service Centre*

## B.B.C. Report

In a section on engineering in the 1957-58 annual report and accounts of the British Broadcasting Corporation (H.M. Stationery Office, 8s) it is noted that the Engineering Division now operates and maintains 200 transmitters with powers ranging from a few watts to 400 kW, 197 sound broadcasting studios, 22 television studios and eight television mobile control rooms, in addition to other equipment. Particulars are given of sound and television coverage and the developments during the year are reviewed. Reference is made, *inter alia*, to the Corporation's experimental colour television transmissions and its part in the International Geophysical Year.

## Generating Plant for Spain

In our last issue we reported that the British Thomson-Houston Export Co., Ltd., had obtained a contract from Fuerzas Electricas de Cataluna, Barcelona, for a 60 MW power station, at Mata, Barcelona, Spain. John Thompson Water Tube Boilers, Ltd., informs us that its share of the contract is in the region of £1,000,000. Besides providing the boiler-house building, it will supply the oil-fired steam generator and its auxiliaries and the boiler-house pipework. The company will also be responsible for erecting the plant and for its commissioning.

The steam generator will have an m.c.r. output of 550,000 lb/hr at a working pressure of 950 p.s.i.g. and final steam temperature of 915 deg F. Heating surface of the boiler will be 7,850 sq ft; of the economiser, 27,100 sq ft; and of the air heater, 64,600 sq ft. The boiler is designed for oil firing only. John Thompson-Kennicott, Ltd., is supplying the water treatment plant and the feed dosing equipment. As we have already mentioned, Balfour, Beatty & Co., Ltd., will be responsible for the civil engineering design and layout of the proposed power station.

## Monitoring Equipment for Russian Factory

About a year ago the British Iron and Steel Research Association announced the development of an advanced system of plant performance recording. It was originally envisaged as an aid in the production of steel products, but it was apparent that the system had many potential uses in industry generally.

One of the licensees of the system, the Digital Engineering Co., Ltd., has just been awarded a contract for monitoring equipment of this type for the Russian tyre factory which is being equipped by a consortium of British firms ("Rustyfa").

The monitoring equipment will serve 500 "detection points" throughout the plant. The counting apparatus will be centralised and an adjacent office will be equipped with page printers where the hourly production totals will appear coded according to size or type. Additional overriding totals for each shift will also be produced and at these times something like a thousand characters of data will be printed out.

## Danger from H.V. Lines on Building Sites

Verdicts of "Accidental death" were returned at an inquest held recently at Redditch on four men who were killed when the rope of a crane lowering a girder on which they were standing fouled an overhead high voltage line.

Mr. J. T. Leek, travelling supervisor for the construction firm, said he had seen the cable poles, but had taken them for telegraph poles. He had not seen any danger notices.

Mr. E. B. Willis, district manager of the Midlands Electricity Board, said the poles and the notices were in accordance with regulations, but the poles did resemble telegraph poles. The notices were considered sufficient by the people who framed the regulations, and the architects and owners of the site were made aware that an 11 kV power line was there.

## Princess Margaret at Brussels

In the course of her tour of the British Industry Pavilion at the Brussels International Exhibition on 30th September, Princess Margaret spent nearly ten minutes inspecting the British Electrical and Allied Industry stand. Most of the time was devoted to the domestic section where Princess Margaret inspected closely refrigerators, cookers, washing machines and other appliances on show. The Princess was conducted round the exhibits by Mr. D. Maxwell Buist,

*Princess Margaret being shown the British electrical and allied exhibits at Brussels by Mr. D. Maxwell Buist*

chairman of the Organising Committee, and Mr. Sam Black, organising secretary.

The Exhibition, which opened in April, comes to an end on 19th October.

### Motor Car Lamp Wall Chart

Philips Electrical, Ltd., has produced new versions of its trade wall chart and booklet covering the complete range of lamp bulbs for private cars, commercial and public service vehicles, scooters, mopeds, etc. A new leaflet dealing solely with lamps for all makes of scooters, autocycles, miniature cars, etc., is also available. The wall chart is printed blue and yellow on substantial cardboard and measures 22in by 16in. It gives at-a-glance details and prices of the entire range and the main types are illustrated. The handy pocket-size booklet, giving similar information plus a list of types suitable for the principal makes of cars, has 44 pages.

### British Lamp-Making Machinery in Czechoslovakia

Two works managers of Thorn Electrical Industries, Ltd.—Mr. E. G. Bealing of Manifold Machinery and Mr. Dan Einon of the Atlas Lamp Factory, Merthyr Tydfil—returned recently from a visit to Prague where they have been supervising the installation of a Manifold built high-speed lamp-making unit at the Holesvice factory, the biggest tungsten filament lamp factory in Czechoslovakia, producing 30 million lamps a year.

### Vision, Lighting and Colour

The British Occupational Hygiene Society is arranging a conference on "Vision, Lighting and Colour" on 11th and 12th November at the London School of Hygiene. On the first day papers will be presented on "The Physiology of the Visual System and Colour Vision," by Professor W. D. Wright (Imperial College); "The Subjective Aspects of Comfort and Discomfort in Lighting, and the Problem of Visual Fatigue and its Measurement," by Dr. R. G. Hopkinson and Mr. J. B. Collins (Building Research Station); "The Rating of Visual Tasks," by Mr. H. G. Weston (Medical Research Council); and "Modern Methods of Artificial Lighting," by Mr. M. W. Peirce (General Electric Co., Ltd.). On the morning of the second day there will be a paper entitled "Colour in Factory Building," by Mr. L. V. Jones (Colour Advisory Department of I.C.I.), and in the afternoon a visit will be paid to the factory of the Paints Division, I.C.I., at Slough, Bucks. The conference is open to non-members of the Society on payment of a registration fee of one guinea. Applications should be made to the hon. scientific secretary, Dr. D. Turner, Associated Ethyl Co., Ltd., Ellesmere Port, Ches.

### Resin Bonded Paper

The Ministry of Supply has published its ninth report on "Plastics in the Tropics" (H.M. Stationery Office, 3s 6d). This report covers phenolic resin bonded tube and gives results of a two-year test in Nigeria.

### Further Hawker Siddeley Reorganisation

Further moves in the reorganisation programme of the Hawker Siddeley Group have been announced. The production of medium and small diesel and petrol engines will be concentrated at the Staines, Middx., factory of Petters, Ltd. The small-engine production at Armstrong Siddeley Motors, Ltd., Brockworth, will also be transferred to Staines. Bryce Berger, Ltd., fuel injection equipment manufacturers, have been restricted by their present factory space adjacent to Petters, Ltd., at Staines. They are, therefore, moving to the group's Gloucester aircraft factory at Hucclecote. The move of Bryce Berger will begin in about two months' time and will take approximately six months. Petters, Ltd., will take over the Bryce Berger factory at Staines and will absorb the productive labour now working there, and a proportion of non-productive and technical staff. Mr. D. K. Fraser, managing director of Petters, Ltd., Staines, will be in charge of the two factories at Staines, and Mr. B. D. Giordan will continue as managing director of Bryce Berger, Ltd.

### Accident Prevention

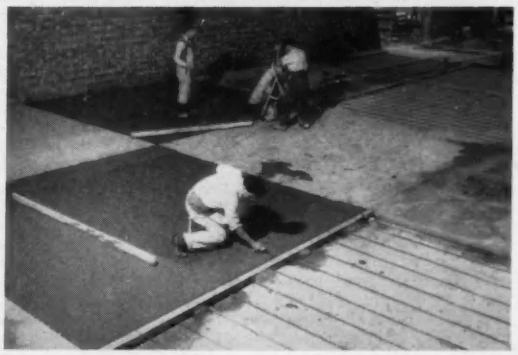
The Royal Society for the Prevention of Accidents is launching a campaign to reduce the number of injuries caused by falls of persons employed in factories and workshops. The theme "Extra Care Stops Falls" runs through all the publicity material prepared for the campaign. Posters will be on display at vantage points in factories, and employees' interest in the campaign will be stimulated by a poster slogan competition which the Society is organising and is offering £100 in prizes.

### Floor Heating Installation

The London Electricity Board has recently built new stores and offices at Bexley Heath. The stores have called for an unusual installation of floor heating, owing to the large area. This has meant casting the concrete in small areas and allowing for expansion between the areas.

The Tyrad ducted system (Tyrad Electric, Ltd.) allows for this type of expansion as the joints used are not solid. Arrangements had to be made, however, for the joints to be aligned with the edges of the concrete sections. The total installed load of the floor heating is approximately 180 kW. Further difficulties over the installation of this building arose as the building is not square. The tubes for the elements lie at an angle of 15 deg to the trunking which runs along the slanting wall. It was not considered advisable to have trunking on the other side of the building as there are entrance doors through which heavy

*Tyrad floor heating being installed at the new stores and offices of the London Electricity Board at Bexley Heath*



lorries may drive. The far ends of the tubing were therefore brought out level with the floor with patent stop ends, fitted with brass plugs which came out flush with the floor finish. In addition, Tyrad storage heaters have been fitted to reception and office areas, giving a connected load of 12 kW controlled by two thermostats. Based on an external temperature of 30 deg F, the internal temperature is 65 deg F for the offices, and 45 deg F for the stores.

### Portable Towers

The portable aluminium-alloy stairway-type towers made by Access Equipment, Ltd., Maylands Avenue, Hemel Hempstead, Herts., are suitable for many applications in the electrical and electronics industries. The towers, which are made under licence from Upright Scaffolds Inc., U.S.A., are assembled on site from "Zip-Up" one-piece folding sections. One man on the ground can unfold the sections which automatically lock into position. These sections are then hoisted, dropped into place and interlocked one on top of the other to form towers of any height from 18 to over 300ft. Each one-piece tower section weighs 100 lb and when folded flat is only 6½in thick. Inside stairways, safety rails and landings make it safe and convenient even for inexperienced men to work at high levels.

*"Zip-Up" tower used for inspecting joints in overhead power lines*

### Television Camera Cable

The cameras of the mobile colour television unit manufactured by Marconi's Wireless Telegraph Co., Ltd., are the 3-tube Marconi "Image Orthicon" type. An 88-way multicore cable is used to connect each camera to the control vehicle, two 100ft lengths of this cable being permanently attached to the equipment with two additional 250ft lengths available when the cameras are operating at a greater distance.

The cable, made by British Insulated Callender's Cables, Ltd., is a polythene insulated multi-core type having twelve screened single conductors forming the centre core around which are laid two multiple units of ten single conductors and five individually insulated coaxial units. A further 45 conductors are laid giving a total of 77 single insulated conductors and five coaxial units, and the cable is completed with protective tape, tinned copper braiding and a p.v.c. sheath.

The cables are terminated with B.I.C.C. Mark 3D polypole couplers, moulded from epoxy resin, which achieve the very close contact spacing required and are suitable for use when the cables are laid out-of-doors.

### National Inspection Council

The National Inspection Council for Electrical Installation Contracting (Aldine House, 10-13, Bedford Street, London, W.C.2) has produced a supplement to the second edition of the Roll of Approved Electrical Installation Contractors. This gives additions to and deletions from the Roll in the period April to August this year.

### Arc and Gas Welding Charts

A new two-colour wall chart, designed for users of its "low heat input" metal-joining process, is now available from the Eutectic Welding Alloys Co., North Feltham Trading Estate, Faggs Road, Feltham, Middx. This daily use chart (TIS.2646) measures 13½in by 18½in and is intended for use by the welder at his point of work. It shows under headings by base metals the most suitable low temperature welding alloys for various types of work and the joints on which they are used. Performance data are given for each base metal and alloy.

Two welding training wall charts for technical colleges and factory training programmes are also available. Both measure 22 by 34in and are designed to fit into welding training programmes by providing students with clear illustrations of correct arc and oxy-acetylene welding procedures. The oxy-acetylene application chart (TIS. 2690) explains the "low heat input" metal-joining process, examines good and bad joint design and the reasons for the efficiency of Eutectic's thin-flowing and bead-forming alloys. Heating and fluxing procedures, and control of the torch are also explained. The arc application chart (TIS.2689) shows techniques for electrode manipulation, procedures for "cold welding," and the use of metalworking electrodes for chamfering and piercing all metals. The application of the company's process to the avoidance of cracking, hardening and embrittlement in the weld zone is graphically illustrated. The charts mentioned can be obtained free of charge.

### Colliery Battery Locomotive

A recent order placed with the Metropolitan-Vickers Electrical Co., Ltd., by the National Coal Board (East Midlands Division) is for a flameproof battery locomotive for Markham Colliery, near Chesterfield. The locomotive, a Metropolitan-Vickers type DBF/12, will be used chiefly for hauling man-riding carriages and material trains over the 2ft gauge lines, involving gradients of 1 in 21·2.

### Qualifications of Mechanics and Electricians in Mines

The Minister of Power has made the Coal and Other Mines (Mechanics and Electricians) (Variation) Regulations, 1958. The Regulations specify the qualifications that must be held after 31st December, 1961, by persons appointed to certain mechanical and electrical posts at stratified ironstone mines. These qualifications include in certain cases the possession of a certificate issued by the Mining Qualifications Board limited in validity to stratified ironstone mines. Provision for the issue of such certificates by the Board is made in the Regulations.

### Dimplex Window Display Material

The accompanying picture shows a display which Dimplex, Ltd., has prepared for the windows of electrical retailers' showrooms. The products shown in the display assembly include: radiator, model C.412; "Dimplex Junior" heater, model ETC.210; oil-filled electric towel rail, "Major" model; and the new infra-red fire,

*Dimplex window display for electrical retailers*

model IRF,1500. In the foreground centre is a flashing Dimplex stockist sign.

### Prototype Tube Trains

Details of plans for the complete replacement of present trains on the Central Line were announced last week by London Transport. Twelve prototypes of a "new-look" type of tube car which will be used on the line have just been ordered from Cravens, Ltd., Sheffield, and it is intended, after trials, to order approximately 330 more cars of the same design. The new rolling stock will be of larger capacity than the present Central Line cars and will have an all-silver aluminium exterior, larger windows, more space round the doors to aid rush-hour movement, rubber springing and fluorescent lighting.

Later this year, with the approval of the British Transport Commission, London Transport will place an order valued at about £4,500,000 for the traction motors and other mechanical and electrical equipment needed for the Central Line train renewal programme.

### Patents in the Channel Islands

Contrary to a widespread belief, British patents and trade mark and design registration do not afford protection in the Channel Islands, which are self-governing Crown Territories. A firm of patent and trade mark agents operating in the Islands informs us that previous patent legislation in Jersey, involving registration by the Royal Court, was not properly effective but a new Patents (Jersey) Law, 1957, which took effect on 1st March this year, provides for the protection of United Kingdom patents by registration in the Island. A similar measure for trade marks came into operation on 1st July.

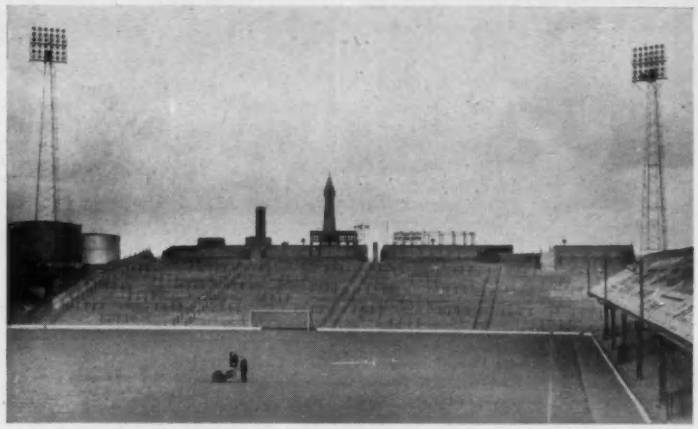
Guernsey also grants protection only to patents and trade marks already registered in the United Kingdom.

### Electric Motor Pocket Book

An illustrated pocket book dealing with the installation and maintenance of electric motors has been published by Higgs Motors, Ltd., Witton, Birmingham, 6. The characteristics and applications of various types of a.c. and d.c. motors and their methods of starting are briefly considered, and extracts from B.S. 2613/1957, and the I.E.E. Wiring Regulations are given. Chapters on earthing and power factor correction are included as well as a summary of belt and gear drives, followed by installation, maintenance and fault finding procedures. The booklet is completed by data tables and conversion factors, and is of a convenient size for carrying in the pocket.

### Optical Instrument Exhibition

An exhibition of microscopes and precision optical instruments for both laboratory and industrial use has been held by W. Watson & Sons, Ltd., Barnet. A complete range of microscopes and associated equipment was displayed, including low power stereoscopic microscopes giving magnification from ×3 to ×140 with large fields of view. These instruments are widely used for both production and final inspection in electric lamp, valve, transistor and wire manufacture and many other industrial processes. Apparatus which has been designed and developed by the company to meet special requirements was shown, and the making of lenses, mirrors, graticules and other components was demonstrated in the company's factory.



*The new floodlight towers of the Blackpool Football Club*

### Unwrought Aluminium from Russia

The Soviet authorities have informed the Board of Trade that Raznoimport—the foreign trade organisation which alone is empowered to sell Soviet aluminium—will not export more than 15,000 tons of unwrought aluminium to the United Kingdom in the next twelve months. At the same time, the Board of Trade announces that it has decided to take no further action on the application by the Aluminum Co. of Canada, Ltd., for an anti-dumping duty under the Customs Duties (Dumping and Subsidies) Act, 1957.

### Football Ground Floodlighting

Blackpool Football Club's new floodlighting scheme, specially designed and supplied by the General Electric Co., Ltd., is being switched on this month. The 144 floodlights are mounted on four 120ft high tubular steel towers. Each tower carries a bank of thirty-six 1,500 W copper floodlights 22in in diameter. Copper instead of the usual steel floodlights are installed to withstand the corrosive effects of the sea atmosphere. The towers, too, are specially galvanised for the same reason. The floodlights consume 216 kW, and electricity for this and the ground safety lighting is supplied by a new 11 kV feed to a 300 kVA substation built directly below the main stand. A 12 kW battery emergency lighting scheme has been installed to maintain the lights in the event of the failure of the main supply.

### Careers in Plastics

The Plastics Institute, 6, Mandeville Place, London, W.1, has published a new edition of its booklet, "Careers in Plastics." This outlines the scope and variety of careers in the plastics industry and is published for the guidance of senior scholars and of those responsible for advising them on the choice of a career. The Institute has also issued a new edition of its membership and examination regulations.

### Trade Announcements

Murray Swanson & Co., Ltd., of Heriot House, Summerhill Terrace, Newcastle-upon-Tyne, 4, have been appointed by **Easco Electrical (Holdings), Ltd.**, as exclusive agents for the installation, sale and service of all Easco loudspeaking intercommunication and "TalkBack" equipment for the counties of Northumberland, Cumberland, Westmorland, Durham and Yorkshire north of a line between Bridlington and Barrow-in-Furness.

**Ottermill Switchgear, Ltd.**, has moved its London offices to 82, Victoria Street, S.W.1 (telephone: Abbey 5095-6).

The sales office of **Larmuth & Bulmer, Ltd.**, is moving during this month to 58, Whitworth Street, Manchester, 1 (telephone: Central 6711/2/3).

The telephone number of **Wild-Barfield Electric Furnaces, Ltd.**, Watford, has been changed to Watford 26091.

**Acheson Industries (Europe), Ltd.**, has moved to 1, Finsbury Square, London, E.C.2 (telephone: Monarch 5811).

# Modern Lighting Practice

IN the following notes we give brief details of some recent lighting installations in which due regard has been given to harmonising with the architectural and other features of the premises, consistent with lighting efficiency.

Fluorescent lighting fittings have now replaced the old tungsten lighting installation at Finsbury's Ironmonger Road Baths. To preserve the graceful appearance of the curved ceiling, it was necessary to site the two rows of twin-tube fittings along the edges of a roof light running centrally down the length of the ceiling. Engineers of Atlas Lighting, Ltd., working in co-operation with the baths superintendent, Mr. A. V. Wright, therefore decided to angle the fittings inwards and thus project the maximum light intensity from each row on to opposite sides of the pool. The fittings used (Atlas FZ/2080) have aluminium parabolic adjustable reflectors finished with a double thickness corrosion-resistant anodised film. Using Atlas 3,500°K white tubes, a light level of 8-10 lm/sq ft is obtained. The electrical contractors were Rawlings Bros., Ltd.

In the stockbroking office, recently converted to fluorescent lighting by Heeps, Willard, Ltd., good use has been made of the "Holoflux" (Holophane, Ltd.) prismatic optical louvre system. An acceptable component of upward light is obtained despite the 4ft suspension, and the high level intensity of fluorescent illumination is controlled and directed through conical patterns in the plates on to the working plane.

The new air-conditioned conference room at the Tengku Abdul Rahman Hall, Kuala Lumpur, was recently completed specially for the E.C.A.F.E. Conference, the first major international conference held in Malaya since her independence. The design and architecture have been carried out by the Public Works Department. All lighting fittings were supplied by Troughton & Young (Lighting), Ltd., and installed by their Far East agents, the China Engineers, Ltd. These include radial pendants from the "Mondolite" range and indirect wall brackets from the "Versalite" range.

## Architectural and Lighting Harmony

The Residential Club for officers and ratings of the Merchant Navy in Dock Street, London, E., has recently undergone alterations involving extensions to the existing premises. The architect was Mr. E. Brian O'Rorke, and the consulting engineers Messrs. Hoare, Lea & Partners. A striking contrast between the new and the traditional has been provided which is exemplified by the choice of fluorescent lighting in the entrance hall, offices and lounges. The new "Thames" range of fittings made by Falk, Stadelmann & Co., Ltd., were chosen and these harmonised perfectly with the modern surroundings.

Both the main entrance hall and conference room of the new office building of Tate & Lyle, Ltd., at Thames Refinery, London, E.16, have specially designed ceiling installations supplied by Lumenated Ceilings, Ltd. The conference room, which is also designed for film projection, is 45ft by 31ft and the lighting is entirely by three "Lumenated" ceiling panels each 36ft by 5ft and lit by sixteen 5ft 80 W quick-start fluorescent tubes. These are mounted in the ceiling cavity in the troughs of "Truscon" flooring. In the main entrance hall, ceiling panels have been shaped to focus attention on the entrance and to emphasise the splayed shape of the foyer. The architects were Messrs. S. N. Cooke & Partners, Birmingham.

The management placed exceptional emphasis on lighting efficiency in the new 5-storey building of the Guaranty Trust Company of New York, Lombard Street, London, which was opened early this year. Crompton Parkinson AR21, totally enclosed diffusing fittings and twin 5ft 80 W de-luxe warm white fluorescent lamps were chosen for all office accommodation on the first, second and third floors. The illumination value is 25 lumens per sq ft.

Benjamin Type 55 "Anolier" reflectors have been installed in the offices of the Port Guarantee Trust of Maidenhead, Berks. These tungsten fittings are specially designed for indirect lighting. All the main parts are aluminium and they are finished in "Brytal" anodised aluminium, the underside of the dish and the exterior of the upper cover being in cream stoved enamel.

## Bank Installation

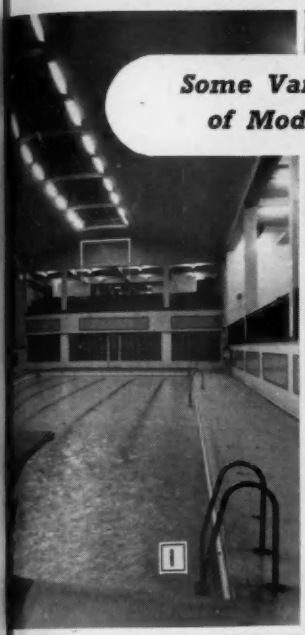
A.E.I. Lamp & Lighting Co., Ltd., equipment has been installed throughout a branch of Barclays Bank, Ltd., in a new 14-storey building in High Street, Birmingham. In this installation lighting fittings have been integrated with other elements of the design and there are no suspended fittings. Over the public part of the banking hall there are two rows of nine twin-lamp 6ft by 2ft "Module" fluorescent lighting fittings in a midnight blue Burgess acoustic ceiling. A blend of de-luxe warm white and warm white fluorescent lamps is used to provide the desired colour rendering and to emphasise the natural beauty of the marble, leathercloth and other materials used. The lighting intensity over the whole of the public space and the counter area is 40 lumens per sq ft, which has been increased to between 45 and 50 lumens on the clerks' side of the main counter by locally-mounted individually-switched 4ft fluorescent reflector fittings. "Eyeball" fittings housing 75 W reflector spotlamps are recessed into the canopy over the bank entrance and 8ft 125 W warm white fluorescent lamps are mounted behind the stepped ceiling of opaque glass over the escalators. Recessed tungsten "shop and display" fittings with stepped glass diffusers are mounted into a ceiling raft at one end of the manager's room. The electrical contractors were the Etna Lighting & Heating Co., Ltd.

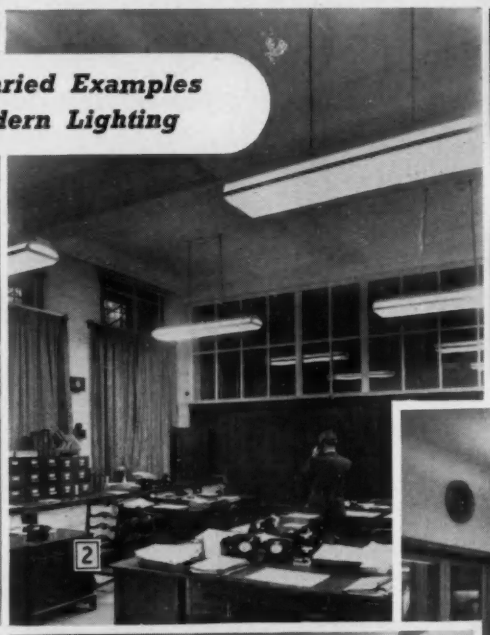
A lighting scheme has been designed to meet the functional and æsthetic requirements of the new offices and showrooms of IBM United Kingdom, Ltd., at 101, Wigmore Street, London, W.1. The fittings, related to the building's proportions, are arranged to reduce the apparent intensity of the light source while maintaining a high level of general illumination. The lighting fittings were supplied by the General Electric Co., Ltd., to meet the requirements of Mr. J. Green, design consultant to IBM United Kingdom, Ltd., and the architect, Mr. C. H. Elsom. The general and private offices are illuminated to a level of 25 lm/ft² by specially designed fittings, each housing two "Osram" 4ft 40 W tubes. Special features are the use of colour—some fittings being Chinese red and others light blue—and the special regard paid to deflection of convection currents. Vinyl plastic sheet diffusers screen the light sources in the fittings near the windows from the view of passers-by. In the showroom, 100-125 lm/ft² is produced by recessed louvred tungsten ballast fluorescent fittings; this intensity can be reduced as required to a general level of 50-55 lm/ft².

Harris & Sheldon (Electrical), Ltd., has supplied its "Luve-Tile" panels for the Birmingham City Art Gallery. Each of the three velaria specially made to the design of the city architect, Mr. A. G. Sheppard Fidler, M.A., B.Arch., F.R.I.B.A., A.M.P.T.I., in galleries III, XV and XVI carries 480 complete panels as well as a number of part-tiles. These areas provide the general lighting of the galleries, the pictures being illuminated by means of fluorescent and filament lamps mounted on the edges of the velaria.

**1.** *Ironmonger Road Baths, Finsbury (Atlas Lighting, Ltd.).* **2.** *Office installation (Holophane, Ltd.).* **3.** *Tengku Abdul Rahman Hall, Kuala Lumpur (Troughton & Young (Lighting), Ltd.).* **4.** *London club lighting (Falk, Stadelmann & Co., Ltd.).* **5.** *Tate & Lyle's new offices at Thames Refinery (Lumenated Ceilings, Ltd.).* **6.** *Installation in Lombard Street Bank (Crompton Parkinson, Ltd.).* **7.** *Office of the Port Guarantee Trust of Maidenhead (Benjamin Electric, Ltd.).* **8.** *Barclays Bank, Birmingham (A.E.I. Lamp & Lighting, Ltd.).* **9.** *Offices of IBM United Kingdom, Ltd., London (General Electric Co., Ltd.).* **10.** *Birmingham Art Gallery (Harris & Sheldon)*

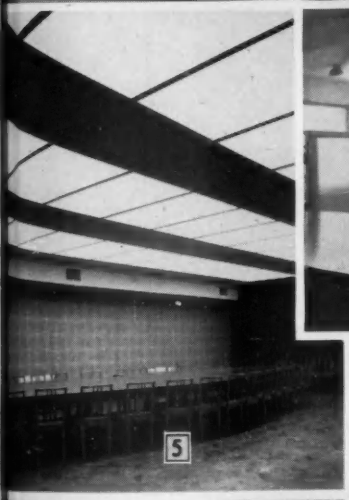
## Some Varied Examples of Modern Lighting


1


2

3

4


5

6

7

8

9

10

# AREA BOARDS' OPERATIONS

## Load Development and Technical Advances

TRADING results of the twelve Area Boards in England and Wales for the year ended 31st March, 1958, were given in last week's issue when it was shown that sales of electricity had increased by 7·6 per cent to 72,661 million kWh. These figures actually understate the rate of development for they relate only to kWh billed to consumers. Referring to this, the South Eastern Board says that because of the cold weather in March its electricity purchases in that month increased by 32 per cent compared with the previous year, but a large proportion of the kWh delivered to consumers will not be recorded as sold until 1958-59. A more accurate measure of the rate of development for the country as a whole is provided by the rise in output of nearly 9 per cent.

Most of the Boards in their reports take the opportunity to look back over the ten years since nationalisation. In that period sales increased by 118 per cent, the Southern Board leading with an expansion of nearly 170 per cent. Last year the North Western Board had the highest total sales (8,085 million kWh). The London Board had most consumers (1,747,099) and the Eastern Board recorded the largest increase—49,891.

### Domestic Appliance Sales Expand

An encouraging sign for the future was the recovery in sales of appliances despite the fact that during the period there was no relaxation of hire-purchase controls or any reductions in purchase tax. In view of the subsequent concessions it is reasonable to anticipate an even larger increase in 1958-59. Including contracting work, the value of which was roughly the same as in the previous year, the aggregate value of the Board's trading activities of this kind last year was £45·8 million against £41·3 million in 1956-57.

Reporting a 17 per cent improvement in domestic appliance sales, the North Eastern Board says that approximately half of this was attributable to greater sales of domestic cookers which increased by 27 per cent.

The Yorkshire Board refers to increases of 12 and 10 per cent respectively in sales of cookers and water heaters and the North Western Board, in addition, experienced marked increases in the demand for refrigerators, convectors, clothes dryers and blankets, though there was a not-unexpected falling-off in sales of some classes of equipment before Budget Day. The Eastern Board's turnover rose by £874,565 to £7,712,295, a total considerably higher than that of any other Board. This side of its operations produced a net surplus of no less than £229,199 compared with £46,215 in the previous year.

Electric space heating, once regarded with some misgivings by supply authorities, is now a useful source of off-peak load in the form of thermal storage block heaters and floor warming installations. The London Board reports that the total load of block heaters in its Area now exceeds 18,000 kW, while floor warming is being adopted in a number of blocks of flats. The Eastern Board is actively publicising the advantages of floor warming; an additional 2,000 kW of this type of heating was installed during the year.

Many local authorities in the North Western Area are considering such heating for their new flats. An alternative form, ceiling heating, was offered by one builder and this is said to have been favoured by most of the buyers. In the same Area, transportable thermal storage block heaters with a total capacity of about 9,000 kW were installed in a variety of premises.

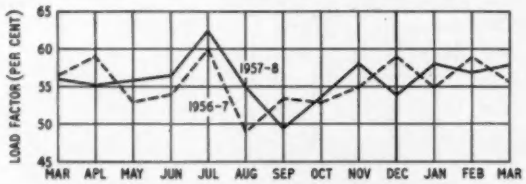
The Merseyside and North Wales Board in its report refers to the installation of floor warming in a block of council flats claimed to be the largest yet heated in this way. The Board also co-operated with manufacturers in the development of a heated underlay for carpets and was largely responsible for developing a combined lighting and heating unit for churches.

A large Tyneside engineering company (North Eastern Area) reports complete satisfaction with the 3,000 kW of off-peak floor warming installed in two factories; when present plans are implemented this load will be increased to some 5,000 kW. Last year the South Wales Electricity Board made further reductions in off-peak "unit" prices and extended the hours during which these supplies could be used. With the lower bulk supply running charge just announced, off-peak applications should become even more competitive.

Industrial supplies showed an increase of 7·9 per cent compared with the previous year. In the Yorkshire Area, electric arc furnaces designed to replace existing open hearth furnaces of approximately 100 tons capacity are said to represent a major development. Many smaller electric furnaces are also being installed and the Board says there is evidence that the electric arc furnace "is now regarded as a commercial proposition by steel makers and capable of melting lower grade steels, whereas originally it dealt with only the higher grade alloy steels."

In another mainly industrial Area, the North Eastern, new and additional supplies with an aggregate capacity of 61,000 kW and an estimated annual consumption of 143 million kWh were connected last year and arrangements concluded for a further 44,000 kW (estimated consumption 215 million kWh per annum). At the end of the year negotiations were nearing completion with the National Coal Board for an omnibus agreement covering all supplies in the Northumberland and Durham coalfields. Increased colliery supplies amounting to some 50 million kWh per annum are to be made available this year.

By the end of March last 72·8 per cent of all farms in the country had been connected. The Eastern Board completed its second five-year rural development programme nine months ahead of schedule and carried out capital works costing £808,000 in 1957-58. Crop drying is considered to offer the best opportunities for extending the use of electricity in agriculture and for obtaining greater efficiency in farming operations. The drying of




*Month by month load factors in the South Eastern Area*

baled hay by means of forced draught is stated to be attracting considerable attention and similarly the North Western Board reports a notable extension of barn hay drying. It also draws attention to the number of commercial growers who now use the all-electric propagating systems which it introduced for earlier cropping of tomatoes. The East Midlands Board's farming load was augmented by the installation of 232 all-electric crop dryers.

Twenty-six sections of the Merseyside and North Wales Board's rural development scheme were under construction at the beginning of the year and eight of them were completed.

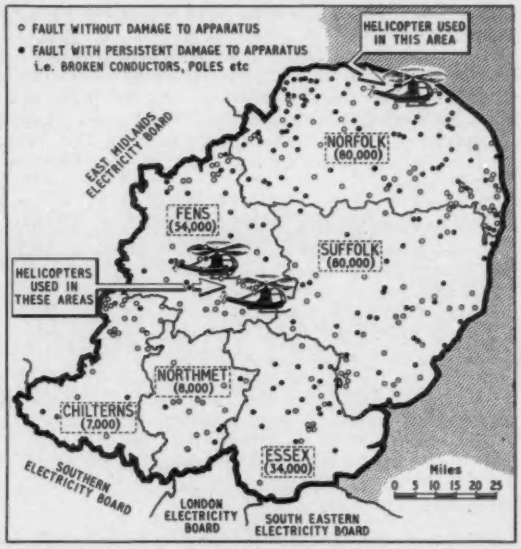
Capital expenditure limitations again prevented the Boards from carrying out as much reinforcement work as they would have liked. The North Eastern Board says that "appreciable difficulties were experienced in maintaining the required degree of security of supply without unduly overloading the Board's major distribution systems." Additional bulk supply points are, however, being constructed and, when these are commissioned, security of supply will be improved. In the Midlands a great deal of work has been done, but the Board is still faced with the difficult task of holding a reasonable balance between the demands for new and additional load, including rural development, and the pressing need for much more reinforcement. A considerable mileage of new h.v. mains has been constructed in South Wales in recent years and more attention is now being devoted to the l.v. networks. Forecasting that expenditure on reinforcement will tend to increase rather than diminish, the Board comments that "the consumer's right to an efficient supply is paramount and this work will continue to be given the highest priority."

A blizzard on 25th February caused widespread havoc to distribution systems in East and South-East England. The Eastern Board refers to the "appalling" conditions in which its repair gangs had to work, yet supplies were restored to 205,000 consumers by midnight the same day. In Kent, working conditions for the South Eastern Board's men were the worst in living memory. A number of them suffered from exhaustion and exposure and two had to receive hospital treatment.

## Technical Developments

To expedite the erection of overhead line poles the North Eastern Board has recently experimented with explosives for excavating the holes. By regulating the quantities used, the dimensions of the excavation can be controlled within close limits. This method is said to have proved extremely successful and has been adopted as general practice throughout the Board's Area.

Investigations at the North Western Board's experimental laboratory and test station at Salford have included the development of a new type of loop impedance testing instrument to assist in rapidly checking the safety of installations; measurement of transformer noise; and tests of soil thermal resistivity. Valuable design information concerning the protection of overhead lines against lightning has been obtained from tests carried out in conjunction with the Manchester College of Science and Technology. The Board has also continued to take a leading part in applying the system of protective multiple earthing to rural premises supplied from overhead distribution. This system, the Board says, is proving to be an economical and satisfactory way of ensuring safety from electric shock to persons and animals in rural areas.




*Consumers affected by the February blizzard in the Eastern Area*

In the South Western Area particular attention has been paid to the importance of reducing the number of planned supply interruptions to the minimum, the measures taken including live line working, temporary supplies from small mobile generating plant, and the use of h.v. plastic cables to by-pass sections of line on which work is being carried out.

Research has been carried out by the East Midlands Board on the earthing of rural substations. By making use of light gauge copper tubes driven into the ground with a light pneumatic hammer to depths ranging from 12 to 17ft, it is estimated that costs can be reduced by 50 to 60 per cent.

The Eastern Board has found that the larger standard sizes of steel-cored aluminium conductor having several strands are unnecessarily strong for wood pole lines. A conductor of adequate tensile strength has been produced

**SIMULTANEOUS MAXIMUM DEMAND (IN ORDER OF MW) AND LOAD FACTOR**

| Board | Maximum Demand MW* | | Time and Date | | | | Load Factor % | |
|---|---|---|---|---|---|---|---|---|
| | 1956-57 | 1957-58 | 1956-57 | | 1957-58 | | 1956-57 | 1957-58 |
| Midlands | 1,976 | 2,196 | 9 a.m. | 14th Jan., 1957 | 9 a.m. | 16th Dec., 1957 | 44·5 | 44·2 |
| North Western | 1,991 | 2,184 | 5.30 p.m. | 15th Jan., 1957 | 9 a.m. | 16th Dec., 1957 | 47·3 | 46·1 |
| London | 2,028 | 2,118 | 5.30 p.m. | 15th Jan., 1957 | 5 p.m. | 17th Dec., 1957 | 38·7 | 40·2 |
| Eastern | 1,824 | 2,040 | 5.30 p.m. | 15th Jan., 1957 | 5.30 p.m. | 17th Dec., 1957 | 44·3 | 43·9 |
| Yorkshire | 1,875 | 2,032 | 10 a.m. | 14th Jan., 1957 | 8.30 a.m. | 16th Dec., 1957 | 48·1 | 48·2 |
| East Midlands | 1,526 | 1,657 | 8.30 a.m. | 14th Jan., 1957 | 8.30 a.m. | 24th Jan., 1958 | 45·7 | 45·6 |
| Southern | 1,426 | 1,621 | 5.30 p.m. | 15th Jan., 1957 | 5.30 p.m. | 17th Dec., 1957 | 43·3 | 43·1 |
| South Eastern | 1,158 | 1,288 | 5–5.30 p.m. | 15th Jan., 1957 | 5–5.30 p.m. | 17th Dec., 1957 | 43·4 | 43·1 |
| Merseyside & North Wales | 1,032 | 1,116 | 5.30 p.m. | 15th Jan., 1957 | 5.30 p.m. | 16th Dec., 1957 | 52·7 | 53·0 |
| North Eastern | 978 | 1,087 | 5 p.m. | 19th Dec., 1956 | 4.30 p.m. | 10th Dec., 1957 | 53·6 | 52·7 |
| South Wales | 882 | 944 | † | † | † | † | 59·0 | 59·5 |
| South Western | 660 | 746 | 9.30 a.m. | 14th Jan., 1956 | 8.30 a.m. | 16th Dec., 1957 | 47·4 | 45·8 |

* Net purchases from Central Authority and other Area Boards. † Not stated.

with a single centre strand of steel which has shown a reduction in cost.

The same Board reports that equipment which it has developed for relaying indications of faults automatically from unattended major substations over the public telephone network has been extended and 36 units are now in operation. Equipment of this kind is also being installed on an experimental basis in the Yorkshire Board's Area.

In recent years the high price of copper has induced Boards to make greater use of aluminium. Now, however, the Southern Board reports that the steep fall in the price of copper has made it economic to change over completely from aluminium to copper conductors for p.i. insulated mains cables and it is anticipated that market conditions will enable copper to be used for some time. Rather more cautiously, the South Western Board observes that the stage has been reached where the blanace is so fine that " the economics of the use of either material have to be kept under constant review."

The Southern Board reports that trials of plastic insulated l.v. underground mains cables and of reinforced cable protection covers incorporating pulverised fuel ash are continuing.

On the organisation side, the London Board last year completed the change-over to the two-tier system. The East Midlands Board modified its original plan for one level of management below Area headquarters and decided to proceed on the basis of an increased number of Sub-Areas with double-headed Districts. As a move towards an increasing measure of decentralisation, the South Wales Board has appointed a number of managers to take comprehensive responsibility for District matters. In the South Western Area, District Managers became directly responsible to the Board as from 1st April, 1958, eliminating the intermediate tier.

The work of the Electricity Consultative Councils is reviewed in reports published with those of the Area Boards.

The Central Electricity Generating Board has produced an attractive illustrated booklet " Power Progress " surveying the industry's achievements and future programme, and a number of Area Boards have also published brochures setting out the highlights of the year's activities.

# MIDLAND COMPANY'S EXTENSIONS

THE recent opening of new extensions to the works and offices of the Midland Electrical Installation Co., Ltd., at Upper Villiers Street, Wolverhampton, marks a further stage in forty years of growth of the company, which specialises in the repair, installation, maintenance and supply of industrial electrical equipment. The late Mr. Henry Joseph in 1919 rented premises in Old Mill Street. By 1936 the business had increased considerably and the size of plant which was being repaired was such that it was necessary to move to larger premises and a move was, therefore, made to the present site off Upper Villiers Street. After the war the size of the plant repaired again increased and during the last few years the need for improved handling facilities, both as regards lifting capacity and height of buildings, has been badly felt. The extension has resulted in the addition of some 35 per cent to the floor space available to the Repair Department, and enables much larger and heavier motors to be handled. The new winding bay is served by two overhead cranes (one 10-ton and one 2-ton) and three 5 cwt wall type jib cranes. The new building is specially equipped for the winding of motors, transformers, etc., and increased space has also been made available for motor assembly and the mechanical engineering section, in which reclaiming of worn parts by metal spraying is an important activity.

An interesting item of equipment is a Hedin specially designed electrically heated stove for baking windings; it will accommodate the largest industrial electrical machines and transformers, and will reach the very high temperatures required by modern silicone varnishes. The new building, which is illuminated by fluorescent lighting, is heated by an electric floor warming installation. Attention has been paid to heat insulation of the building, the roof of which is lined with a glass wool blanket.

The administrative and engineering staff has grown considerably in recent years as the Wolverhampton office also serves Shoolbred's of Luton, whose interests were recently merged with those of M.E.I. The recent extensions, therefore, include a new office block, and this too is heated by electric floor warming (" Panelec "). Whereas the cables in the works are buried in the floor, those in the office block are run in aluminium ducts laid in the concrete, so that the cables can be withdrawn and new ones inserted without disturbance of the floor, should this be necessary at any time. Part of the old office block is now heated by a 6 kW " Calidec " floor warming installation.

*Left: The exterior of the new extensions of the Midland Electrical Installation Co., Ltd., Wolverhampton and (right) the new winding shop*

# Television Tube Manufacture

## NEW GLASS SEALING PLANT

LAST week we had the opportunity of visiting and inspecting the television cathode ray tube factory of Siemens Edison Swan, Ltd., at Sunderland, where a new glass sealing plant has just been completed. This adds another 100,000 sq ft to the 250,000 sq ft of factory space brought into operation two years ago. The television tubes made in the factory are marketed under the trade name "Ediswan-Mazda," and the one-millionth tube was completed this month.

The mass production of television cathode ray tubes at this factory is at present at the rate of 12,000 a week, and the use of automatic methods enables the entire manufacture to be carried out by the minimum number of operators. The factory runs continuously through 15 shifts from Monday to Saturday morning inclusive and the total number of employees is about 660.

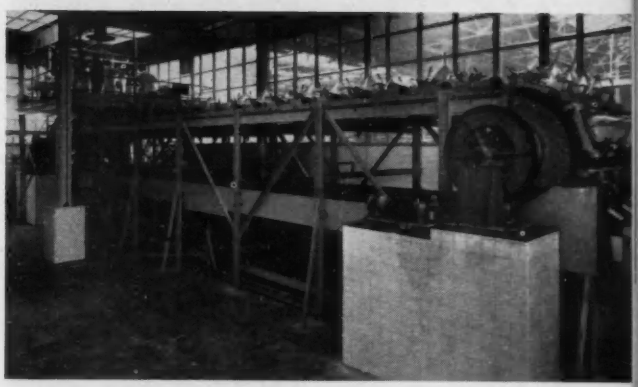
The manufacture of "Ediswan-Mazda" television cathode ray tubes is carried out by a series of automatic processes linked by nearly two miles of overhead conveyors. The equipment is estimated to be worth £1¼ million. It has been designed, much of it to the company's own specification, for the specific purpose of making cathode ray tubes.

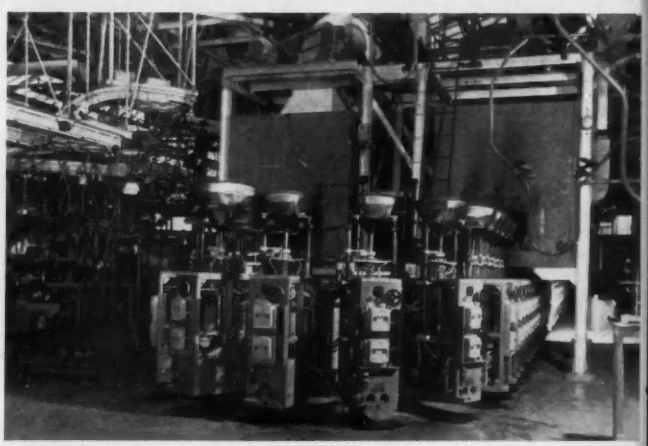
The glasswork consisting of the face, back and neck is first placed in pre-heating ovens and brought slowly to an appropriate temperature. The backs are then joined to the necks and transferred to a circular multi-station machine which makes the anode hole and drops in the anode button. After annealing, the completed backs are inspected and joined to the pre-heated faces by an automatic electrical face sealing technique. The finished bulbs enter a lehr which holds them at a high temperature for a period and then gradually cools them to allow the glass to "settle." They are then inspected.

In the bulb-washing section, where surface contamination is removed, the bulbs are subjected to various jets of chemicals and demineralised water rinses. There is also a similar washing process for reclaimed bulbs, but using different proportions of chemicals.

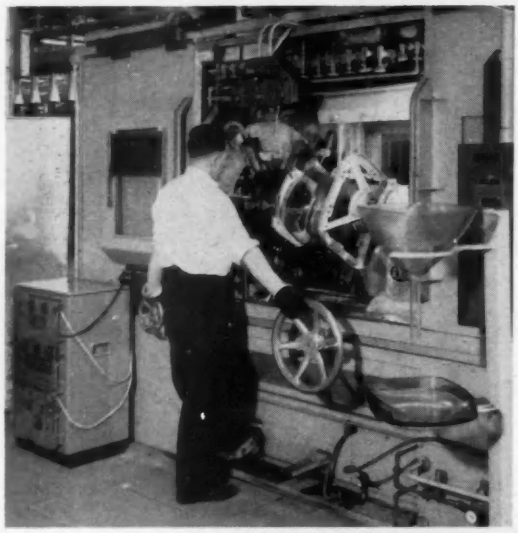
The next stage in the process is the screening of the faces, which takes place on a large conveyor. At the start of this conveyor barium acetate and water are poured into the upturned bulbs in quantities according to tube size. Phosphor powder and silicate are added, and the mixture is allowed to settle for the 20 minutes which it takes for the conveyor to travel from one end of the machine to the other. With the screen now formed, the tube reaches the end of the conveyor where decantation of the liquids takes place, the tube returning on the underside of the conveyor to the take-off point. Inspection of the screen under fluorescent light now takes place. The screen is next coated with a bedacryl and tolurine solution which provides a plasticiser to protect the coating during the subsequent aluminising operation.

The tubes are next placed on a conveyor and dried out





*Top: The screening conveyor showing chemicals settling and (right) liquid being decanted. Centre: A point in the factory where a number of the overhead conveyors converge. The long oven is the final bake lehr, which follows the aluminising process. Bottom: Front view of an in-line exhaust machine, showing self-contained pumping units with tubes in position*



*Joining faces and backs of cathode ray tubes by an automatic electrical sealing process*

by means of hot air pokers. Aquadag, a graphite solution, is then applied inside the neck to provide a connection between the anode button and the gun when it is subsequently inserted into the tube.

The aluminising process, which is fully automatic, involves several stages of evacuation. After a vacuum check a small pellet of aluminium is volatilised inside the tube and it settles to form a mirror behind the screen. There is a further inspection at this stage. Aluminised tubes are now fed into a 120ft long lehr, where they receive a four-hour heat treatment. A rigid inspection with the aid of ultra-violet light then takes place, only those screens without any trace of blemish being allowed to go forward.

The electron guns, comprising anodes, grid, cathode and heater are next inserted into the necks. These "mount assemblies" arrive complete from another Siemens Edison Swan factory in Sunderland. The marrying of gun to neck is an extremely fine operation with little permissible tolerance, as it is at this point that the distance from gun to screen is set.

Evacuation of the tube follows on in-line exhaust machines. These embody conveyors carrying 159 exhaust cubicles each. Each cubicle is an exhaust machine in its own right. The cubicles move round one station at regular intervals between 30 and 60 sec. Different sizes of tubes can be evacuated simultaneously on the in-line machine as each cubicle may be separately adjusted. During this process, not only is it necessary to remove the air, but also to heat all parts inside and outside to various temperatures by means of radio frequency heating and external baking of the bulb. The cubicles are withdrawable so that they can quickly be replaced in event of a fault arising. The cap base is now added, after which r.f. heating of the barium getter is carried out. This removes from the tube any final traces of residual gas.

Electrical ageing or "running-in" of the tube follows, the object being to stabilise tubes which are in various stages of activation. Ordinary ageing is followed by high-voltage ageing which entails bombarding of emissive spots to prevent spurious emission. Complete electrical and picture tests are now made. Before dimensional inspection, the conical section of the bulb is externally coated with aquadag to a specified thickness. This provides the television receiver manufacturer with a ready-made capacitance between the internal aluminium film and the external aquadag.

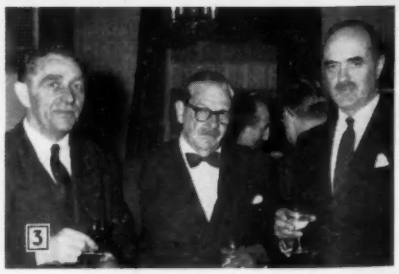
At the packing station the tube undergoes a final inspection. Finished tubes are then packed and dispatched.

## CONTRACTORS' DIAMOND JUBILEE

THE firm of Barlow & Young was founded in 1898 by Mr. L. Barlow; consequently 1958 is its diamond jubilee year. This landmark was celebrated last week at a cocktail party held at the St. Ermin's Hotel, Westminster, S.W.1. Guests numbering about ninety were received by Mr. S. L. M. Barlow (son of the founder, and managing director) and Mr. H. Clifton (director), and the chairman of the company, Mr. H. T. Young, and other directors were present, with many other prominent electrical men. Mr. L. Barlow, who is now 85, was seen to be still very active.

During the evening Mr. S. L. M. Barlow gave a succinct review of the history of the business and thanked those who had supported it during its sixty years. He mentioned that his father became a member of the I.E.E. in the year the firm was started; his certificate of membership had been signed by Silvanus P. Thompson (president), Lord Kelvin (member of Council) and W. G. McMillan (secretary).

Sir Harold Bishop, past-president of the Institution of Electrical Engineers, conveyed the guests' congratulations to the company in a brief appreciative speech.




*1. Mr. L. Barlow (founder of the business) with Mr. H. T. Young. 2. Mr. Leslie Gamage, Mr. S. L. M. Barlow and Mr. H. Clifton. 3. Mr. L. C. Penwill, Mr. W. K. Brasher and Sir Harold Bishop*

# Power Factor Correction

## B.I.C.C. INSTALL 18 MVAr CAPACITOR FOR DISTILLERS COMPANY

THE calcium carbide factory of the Distillers Co., Ltd., at Kenfig, has been in operation since 1940, and three open type electric arc furnaces are installed for smelting lime and coke and converting it to calcium carbide. At maximum demand periods the works load is about 55 MW at 0·84 p.f. lagging, mainly due to the furnaces.

Since the South Wales Electricity Board imposes a financial penalty if the average monthly power factor falls below 0·95 lagging it was decided to install capacitors to give a value in excess of this figure. This has turned out to be the largest industrial shunt-connected capacitor bank in the British Isles and it is estimated that it will save the company £30,000 on its annual electricity bill. The 72 tank-type capacitors making up this bank were supplied by British Insulated Callender's Cables, Ltd.

Calculations showed that 18 MVAr of capacitors would give the desired improvement. Because the carbide furnaces constitute the major portion of the works load the capacitor bank is connected as near as possible to the furnace transformer primary busbars. Also connected to these busbars through 33 kV oil circuit-breakers are two 10 MVA, 33/11 kV transformers which supply the auxiliary load of the factory.

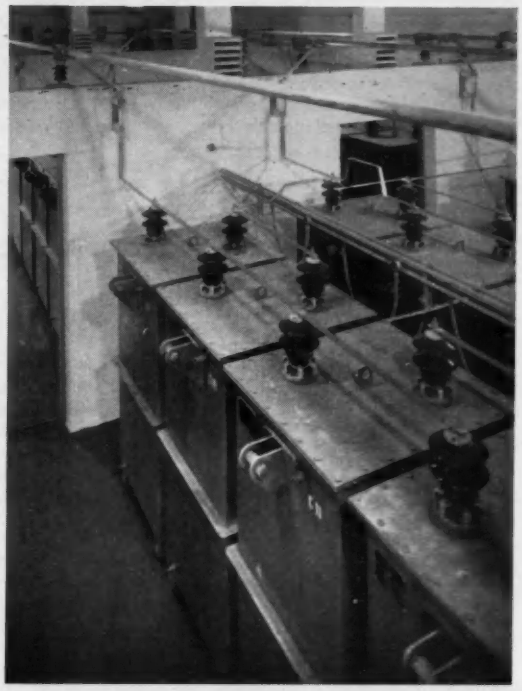
The 18 MVAr bank is divided into two equal capacitor sections, one being connected to the secondary side of each 10 MVA transformer, and 33 kV, 750 MVA circuit-breakers are used to switch each section. The voltage rise on the secondary side of the 10 MVA transformers has been accommodated by adjustment of the off-load tappings. The transformers are connected on the secondary side, through 11 kV oil circuit-breakers, to a ring main circuit which is provided with a normally open bus-coupler. By closing this bus-coupler it is possible to supply the total auxiliary load from one 10 MVA transformer whenever the other transformer with its associated capacitor bank is switched out of circuit.

Each 9 MVAr capacitor bank has an oil switch for off-load isolation. This has Castell mechanical interlocking with the 33 kV and 11 kV o.c.b.s and with the doors of the capacitor building. Electrical interlocking is also provided between the 33 kV and 11 kV o.c.b.s controlling the 10 MVA transformers. Facilities are provided for remote operation of the o.c.b.s from panels in a control room which is manned 24 hours a day.

As the capacitors could not be installed in the open a special building was erected in which the two 9 MVAr banks are housed in separate rooms. In each room there are thirty-six 250 kVAr, 6·35 kV 50, single-phase oil-impregnated tank-type capacitors arranged in three bays with an additional bay should a fourth furnace be installed.

The supply for the capacitor banks is brought into the building by underground single-core lead-covered cables, terminating in wall-mounted cable sealing boxes in each room. An overhead system of copper tubular busbars supported on porcelain insulators carries the supply to each bay of capacitor banks. Flat copper strip busbars are used for the connections between the bushing terminals of the capacitor tanks and pole-operated off-load isolating switches, which in turn are connected to the overhead busbar system. The twelve capacitor tanks in each bay form a three-phase section of the complete bank with facilities for off-load isolation.

In addition to the normal internal fuse protection of element groups within each capacitor tank, supplementary protection is provided for each three-phase section of twelve tanks. Each section is divided into two equal star-connected groups with a fully insulated wound primary current transformer connected between the two floating neutral points. A relay in the secondary circuit of the current transformer operates an audible alarm in the control room whenever current flow between the neutral points reaches a pre-selected value. In the event of a serious loss of capacitance in the tank, the alarm will operate. Indications of bus faults within any section are also ensured.



*Some of the "thirty-six units" making up the 18 MVAr capacitor bank at Kenfig, South Wales*

Because of atmospheric conditions it was necessary to pressurise the plant, and to keep the temperature inside the building within permissible limits a fairly elaborate ventilating system has been installed. The total heat loss for the two banks of capacitors is about 45 kW and the ventilating plant has to dissipate this heat in addition to any due to the normal outside temperature. The roof is insulated to limit absorption of heat from outside. Filters are installed at the intake end of the system and two fans feed air into the ducting. In cold weather one fan is sufficient to keep the inside temperature below the permissible limit.

The inlet fans and filters are in a separate room at one end of the building, with the inlet grill in this wall. The extract fans are at high level at the other end of the

building. Visible indication that the fans are running is provided in the control room.

Thermometers provide remote indication in the control room of ambient temperature in either of the capacitor rooms. Should the ambient temperature exceed the permissible limit an audible and visual alarm is provided in the control room. Every capacitor tank is fitted with a resistance thermometer connected to a multi-point indicator in the control room.

Despite the remote possibility of an oil fire from any serious failure of a capacitor, Pyrene $CO_2$ fire-extinguishing equipment has been installed. This system is brought into operation by means of electrical heat detectors located at ceiling level in each room. Audible and visible warnings are given in the control room if the fire extinguishing equipment operates.

The Engineering Division (South) of the Distillers Co., Ltd., acted as consultants for the whole scheme. The capacitors, busbars, cables and sealing boxes were supplied by British Insulated Callender's Cables, Ltd., and the capacitors, busbars and cables were installed by British Insulated Callender's Construction Co., Ltd. Switchgear and protective gear was supplied by the English Electric Co., Ltd., and temperature indicating equipment by the Cambridge Instrument Co., Ltd., and J. H. Hayman (Electrical Engineers), Ltd., who also installed the secondary wiring. The ventilation scheme was provided by Troughton & Young (Heating), Ltd.

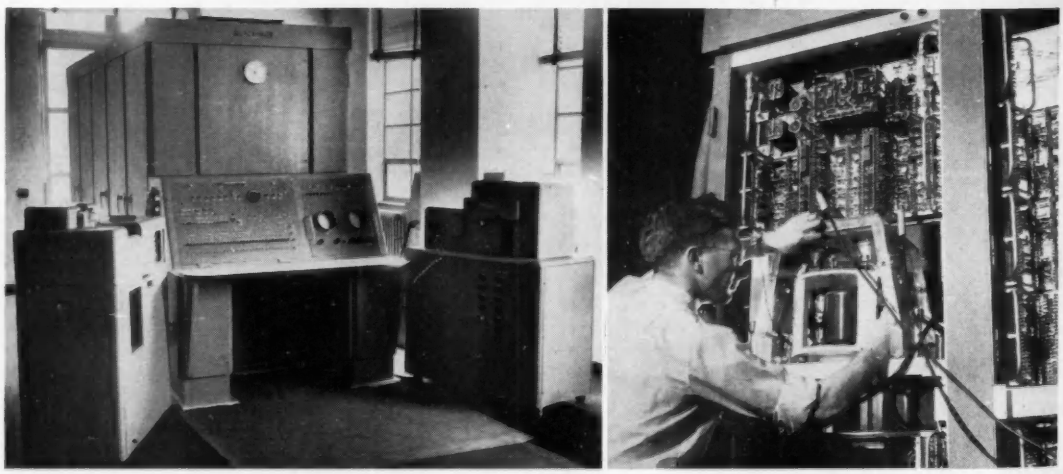
# SYSTEM SIMULATION

## Digital Computer Installed at Bankside House

THE Digital Electronic Universal Computer Engine (DEUCE) is the first installation of its kind to be operated by the supply industry and is now in service at the headquarters of the Central Electricity Generating Board at Bankside House, London. It has been installed to deal with the problem of forward planning involving transmission line reinforcement compatible with estimates of future demand and future fuel supplies.

The English Electric DEUCE Mark I, as installed at Bankside House, has a high-speed store using mercury delay lines and a large store of longer access time provided by a magnetic recording drum with a capacity of 8,000 words. The programme is prepared in coded form on punched cards. The punched cards also record the characteristics of each generating set in the network, the amount of fuel and the cost involved for each unit generated by the set and the generator's geographical position in the network. Any restrictions of power flow on individual transmission lines are also noted on the card system as well as the characteristics of each transmission line. Estimates of the load demands are also coded. The computer takes 13 hours to produce a complete set of answers for any one planning problem.

The British grid system is to-day the largest power supply network in the world operating as a fully integrated system and, as such, has created problems of day-to-day operation and in particular problems in long-term planning. With the new computer, it is now possible to make a rapid appraisal of alternative schemes of development for five, six or seven years ahead. These schemes could not have otherwise been assessed in the detailed form necessary to allow management decisions on future policy. The C.E.G.B. own, at present, 253 power stations having a maximum output capacity of over 22,000 MW. Current plans for expanding the generating capacity to meet the growth of load expected by the winter of 1963-64 include nearly 10,000 MW of additional output capacity. Forward planning of the transmission and generating plant to meet this increased capacity is essential for economic operation.



*Left : English Electric DEUCE computer installed at Bankside House. Right : The magnetic drum, which forms the backing storage for the memory system of the DEUCE, being adjusted*

# ARGENTINA'S NEED OF POWER

**Installation of generating plant in Argentina lags far behind the potential demand and this is handicapping industrial development. Many power schemes have been projected, some of which are in hand, but future progress depends on finance and the Government's attitude towards foreign investment.**

**FROM OUR LATIN AMERICAN CORRESPONDENT**

A SURVEY of Argentina's economic situation, prepared by the Economic Commission of Latin America (E.C.L.A.) at President Frondizi's request, deals at length with the electric power crisis and possible solutions. The crisis, described as "one of the most serious factors leading to the country's economic stagnation," is ascribed to inadequate investment of public funds in expansion projects and failure to create conditions capable of attracting private capital. Despite constantly increasing domestic and industrial demand installed capacity has only risen from 1,356 MW in 1935-39 to 2,070 MW in 1955. The power shortage and distribution difficulties have hampered the operation, mechanisation and expansion of industry.

E.C.L.A. estimates that, as electricity consumption increases at a much higher rate than the gross national product, existing installed capacity must be trebled between now and 1967. In order to eliminate the present deficit, replace obsolete equipment (estimated at 430 MW) and meet future requirements it will be necessary to install 6,400 MW at a cost of about $1,850 million (U.S.), including $750 million to be spent abroad. If, however, the cost of projects now being carried out is deducted the estimated new investment would be reduced to $1,470 million. The report points out that this seemingly heavy investment really amounts to only 4 per cent of the estimated national total for the period.

## Planned Expenditure

Particulars of the proposed expenditure in U.S. dollar equivalents up to 1967 are given below, with the probable percentage of the total cost to be spent abroad under each heading.

| | $ million | Foreign currency per cent |
|---|---|---|
| Thermo-electric plants | 428 | 57 |
| Hydro-electric plants | 492 | 33 |
| Nuclear plants | 197 | 76 |
| Transmission lines | 320 | 42 |
| Primary distribution lines | 288 | 15 |
| Distribution networks | 128 | 8 |
| Totals | 1,853 | 40 |

E.C.L.A. estimates that owing to population growth and economic development national consumption of electricity, which amounted to 6,100 million kWh in 1955, will reach 13,000 million in 1962 and 22,450 million in 1965. The last-named figure represents an average annual increase of 11·5 per cent since 1955, or double the rate recorded from 1943 onwards, when difficulties and restrictions imposed on the companies slowed down expansion from 7·1 to 5 per cent annually, although the demand was doubling every ten years.

According to the projects outlined, hydro-electric plants will contribute 2,400 MW towards the total increase of 6,400 MW, or 2,900 MW if the proposal to install a nuclear plant is rejected. The available hydro-electric power in Argentina is estimated at 11,000 MW, but much of it is too far distant from consuming centres to permit economic development.

By 1967 the E.C.L.A. plan proposes to increase the power supply to Greater Buenos Aires by 2,400 MW, including 400 MW to replace obsolete plant. A substantial part of the suggested extensions are already being carried out, while others are about to be put in hand. The power station at San Nicolas, which now supplies 100 MW to the capital, and the transmission lines linking the plant to the Buenos Aires network, were inaugurated in October, 1957. The total capacity of the San Nicolas station will be 300 MW, but 200 MW will be reserved for Rosario and elsewhere.

## Large Project

The South Dock project for the construction, by British firms, of a 600 MW station should be completed by December, 1961, but the first of the five 120 MW generators is planned to start operating in 1960. The structure to be erected will permit a future expansion to 1,200 MW. Seven substations will be built and used, in part, to connect the South Dock station with the distribution network and part to provide a link with the San Nicolas installation.

By 1962 the proposed extensions of the C.A.D.E. and Italo plants will provide 370 MW, while other small concerns will furnish 30 MW. The question of whether the C.A.D.E. concession has lapsed or not has been submitted to the courts, and an injunction has been obtained maintaining the existing situation until the verdict is pronounced. Nevertheless the Buenos Aires City Council has approved a decree ratifying the decision of the Provisional Government to cancel the extension of the concession, granted by the same Council in 1936, and has invited tenders for another 125 MW turbo-generator. Although the company has protested against the call for tenders, it has expressed its willingness to transfer its assets to the State against adequate compensation, or build the necessary extensions. It offers to install a 125 MW generator by 1960 and a second similar unit later, provided the Government furnishes the essential guarantees for the capital invested, estimated at $23 million (U.S.), plus 2,800 million pesos.

Other projects, referred to in E.C.L.A.'s report, include El Chocon, to supply 500 MW by 1967, Salto Grande, Rio Mendoza, etc., 400 MW and the nuclear plant, 300 MW. As regards these, the distribution system carrying power from the hydro-electric plant at Nihuil, in the Province of Mendoza, to the town of San Rafael and to Mendoza, the capital, was inaugurated at the end of 1957.

Tenders were received at the end of last year for the construction of the hydro-electric station at El Chocon,

on the Limay River, 1,200 km from Buenos Aires. The tenders were subsequently cancelled as only one firm, Neyrpic Argentina S.R.L., bid for the complete work, including the supply of electro-mechanical equipment by a consortium of British, French and Italian enterprises. Moreover, the prices quoted were considerably higher than the estimates. The Provisional Government, which considered the project to be a matter of extreme urgency, then opened a credit of 5,000 million pesos to finance the work. The project provides for building a dam, 1,400 metres long and 78 metres high, at Bajada del Chocon to form an artificial lake, covering 794 square kilometres; the construction and equipment of a power house with a capacity of 700 MW and an estimated annual production of 2,800 million kWh; and the supply and erection of transmission lines to Buenos Aires and other cities. In March last the National Power Board was authorised to negotiate directly with Neyrpic Argentina for preliminary engineering works and, failing agreement, to commence and carry out the work. Meanwhile further studies are being made and it is believed that separate bids will be invited for the various sections of the work.

In 1957 the Government revived the Rio Bermejo Canal scheme and tenders for the first two stages were received early this year. These cover certain electrical work, preliminary surveys and specifications. The complete project, which comprises three stages, provides for building a dam, 3,900 metres long and 68 metres high, near Oran, in the Province of Salta, to form a reservoir with storage capacity for 3,700 cubic metres of water; the construction of a 190 MW hydro-electric station; and the building of a canal parallel with the River Bermejo and navigable for 1,000-ton barges, from Oran to Barranqueras, on the Parana River. The canal would be equipped with 28 locks, at each of which a 5,000 kW plant would be installed to supply power locally. Later it is proposed to build a second canal, 1,000 km long, from Oran to Santa Fé.

An agreement has been signed between the National Government and the provincial authorities of Rio Negro, Neuquen and Chubut to form a body to be known as the North Patagonian Corporation. It will exploit the iron ore field of Sierra Grande, in Rio Negro, and other mineral deposits, utilise the water courses of the Negro and Chubut Rivers and build hydro-electric stations.

The National Power Board has signed a contract with the Société Grenoblaise d'Etudes et d'Applications Hydrauliques for preliminary studies to determine the feasibility of building a tide-operated power station in the Valdes Peninsula (Chubut), the capacity to be at least 600 MW. It is proposed to cut a channel across the isthmus, where it is only 6 km wide, and utilise the concentrated ebb and flow of the tide, which is high on the San José Gulf side when it is low in the Golfo Nuevo.

Dr. Frondizi has recently repeated his assurance that foreign capital will be welcome and will enjoy full guarantees. It is to be hoped he will be able to overcome ultra-nationalist opposition. Mr. V. A. Pane, an executive director of the World Bank, who was in Buenos Aires in June last, expressed satisfaction with the President's declaration of policy towards foreign capital and the prospect of an early settlement of the claims for compensation for the expropriation of several of the American & Foreign Power enterprises.

# MOSCOW FILM CONGRESS

From a Special Correspondent

THE XIIth Congress of the International Scientific Film Association which was held in Moscow from 10th to 20th September, included a popular science film festival for the first time. The films were remarkably varied in subject matter, ranging from atomic physics to agriculture, from chemistry to child art, from mechanical engineering to meteorology. More than 200 in all were screened during the eight working days of the Congress.

Among the films of electrical interest was one from the British Electrical and Allied Industries Research Association, "High-speed Photography of Self-luminous Objects," the first part of which showed material transfer in aluminium self-adjusting welding arcs, the second demonstrating the effects of exposure on them. The Cavendish Laboratory contributed "The Electron Microscope in Solid State Physics" including cine-recordings of the movement of dislocation in metal foil, and electron-microscopic studies of colloidal silver iodide crystals.

Another interesting and unusual British entry was "The Television Eyemarker" made by Dr. Mackworth of the M.R.C. Applied Psychology Research Unit, Cambridge. Using the old-established principle of pupillary reflection of light a film camera records eye movements as the viewer watches on a TV screen the scene or object being studied. The reflected light is superimposed on the view and the double image recorded by another camera, so that one may follow eye movements as an object or scene is being studied—a device with practical applications already in such fields as the training of air pilots.

Edisonvolta of Milan produced "The Three Electric Lines Leading to Milan," showing the installation of a high voltage line. The Popular Science Film Studios of Kiev had "Electron Tube," a teaching film in four parts showing the design and operation of cathode ray tubes and some of their practical applications. Another teaching film, by Veb-Defa Studios, East Germany, was "Voltaic Arc—the Tool of the Century," showing the principles of electrical and chemical welding and instancing the importance of automation in welding in shipyards.

Automation also formed the subject of Regie Renault's new film "New Machine Tool Automation," illustrating an automatic transmission with automatic starter serving three machines. This film used animation and live photography to convey its information.

"How Sound was Caught" was a Czech review of the various methods of recording sound, criticised by some delegates on the grounds that there was too much emphasis on optical recording and not enough on recent progress with magnetic recording.

### Radio Hobbies Exhibition

The International Radio Hobbies Exhibition will be held from 26th to 29th November at the Royal Horticultural Old Hall, Vincent Square, London, S.W.1. It will be opened by Air Marshal Sir Raymund G. Hart, Controller of Engineering and Equipment at the Air Ministry.

# AERO ENGINE TESTING

## Opening of the Rolls-Royce High Altitude Plant

THE high altitude aero engine test plant of Rolls-Royce, Ltd., at Derby was opened by the Prime Minister, Mr. Harold Macmillan, on 26th September. The plant, which cost £5,800,000, is capable of testing turbo-jet and turbo-prop engines under altitude conditions up to 70,000ft and at 2·5 times the speed of sound. It is designed to supply engine intake pressures varying from 1 p.s.i.a. to 55 p.s.i.a. over a range of temperatures varying from −90 deg C to +190 deg C while the rest of the engine including the exhaust is subjected to the pressure corresponding to the selected altitude, i.e. down to 0·5 p.s.i.a. To provide the air for the engine intake and to lower the pressure around the rest of the engine, the plant consumes up to 60 MW of electrical power.

The plant is divided into three main sections: the input building, which includes two aero engine test cells; the exhauster building; and the compressor test rig. In the input building, air at atmospheric pressure is drawn in through a Sturtevant electrostatic filter by the input compressor driven by a 22,000 h.p. British Brown Boveri synchronous motor and is compressed to 55 p.s.i.a. at 190 deg C. This air, in the main, then passes through a water-cooled heat exchanger, an ammonia refrigerating plant, a water separator and, finally, a Silica Gel, Ltd., chemical drying plant. At this point it is completely dry and at a temperature of 8 deg F. This dry air can be passed through a control valve direct to one of the engine test cells or diverted through an expansion turbine to give temperatures down to −100 deg C. A recuperator turbine is provided coupled direct on to the input compressor so that air surplus to engine requirements can be passed through this turbine and the power recovered. At the rear of each test cell the ductwork leaves the input building and continues in the open air to the exhauster building via primary and secondary coolers.

There are a total of five exhauster compressors in the exhauster building, each driven by a 22,000 h.p. electric motor identical to the one which drives the input compressor. Four of these five compressors are identical and have a volumetric capacity of 170,000 cu ft/min. The fifth high-pressure compressor is one-third the size of the other four and incorporates a recuperator turbine for power recovery when used for pressure generation.

The ductwork and valves in the exhauster building are so arranged as to permit a multiplicity of exhaust or pressure arrangements. For example, they can be connected to give three exhausters in parallel discharging into the fourth, which in turn discharges into the fifth; or two in parallel discharging into the third and then into the fourth, depending on the size of the engine under test. When used as exhausters for evacuating the engine test cells, the compressors, in whatever configuration they are used, finally discharge the exhaust gases through a silencer to atmosphere.

To improve the flexibility of the plant as a whole, a cross-connection between the exhauster and input buildings has been provided to augment or replace the input compressor should there be any failure of this machine.

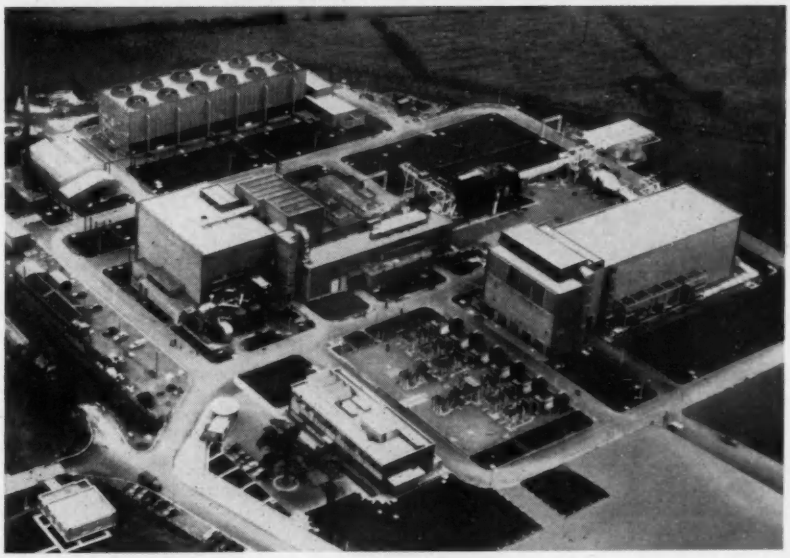
To assist in achieving high utilisation of the plant, a compressor test rig has been located on the site adjacent to the engine test cells. Two of the exhaust compressors are compounded to provide air at 155 p.s.i. and 200 deg C, which is ducted to the compressor test rig house to drive a 15,000 h.p. air turbine which, in turn, can drive engine compressors at speeds from 3,000 to 11,000 r.p.m. In the drive shaft between the air turbine and the test compressor is an optical torquemeter.

Again, to improve the utilisation of the plant, a pipeline has been laid from the exhauster building to a neighbouring site where there exists a combustion laboratory.

### Air Circuit Control

Control of the air circuit is carried out from three places, the main control room, engine test control and compressor test control room. The main control room is the nerve centre of the whole plant and here the main air circuit to suit the test required is set up, the main compressor sets started and all auxiliaries such as refrigerators, dryers, hydraulic pumps and electrostatic filters are started and supervised. Air circuits are selected

*Aerial view of the aero engine testing plant. The cooling towers are shown at the top left, the input building in the centre and the exhauster building at the right*



by the introduction of the appropriate template into a plate desk and a mimic diagram gives a visual indication of lines in use and valve functions.

Complete instrumentation for engine testing is housed in the engine test room, records being obtained photographically. In adjacent rooms, instrument service and electronic recording are provided.

The interconnections of the air circuit are achieved by valves of various types. The isolating valves are, in almost every case, electrically operated from the main control room by push-button. In the case where rapid movement is required, hydraulic rams are used instead of electric motors. These are also operated from the main control room by push-button. The valves controlling temperatures and pressures in the circuit and the correct functioning of the compressors are all hydraulically powered and, when subject to automatic working, are actuated via magnetic amplifiers operating from signals received from pressure and temperature sensing points. The magnetic amplifiers compare these signals against manually set valves, any out of balance causing movement of the main valve until the error is cancelled. Thus pressures and temperatures are held automatically, the desired settings having been previously set. The automatic control is taken a step farther on another desk, where the desired settings can be varied to a programme, enabling an engine under test to be subjected to all the variations met in a complete flight plan.

*Main control room, showing exhauster sets beyond the windows*

*Mimic diagram in the main control room*

## Electrical Supplies

Power for driving the six 11 kV, 22,000 h.p. synchronous motors is supplied by the East Midlands Electricity Board at 33 kV. This is transformed in the Rolls-Royce substation by six 15 MVA, 33/11 kV Ferranti transformers controlled by Reyrolle 33 kV, 1,000 MVA small oil volume switchgear. Each transformer is directly connected via a British Brown Boveri Korndorfer starter to one of the six 22,000 h.p. motors. Power for auxiliary services is obtained from a different source of supply at 6·6 kV. Oil circuit-breakers of Ferguson Pailin manufacture control the h.v. side of 6,600/415 V transformers supplied by the Yorkshire Electric Transformer Co., Ltd. Medium-voltage switchgear of English Electric manufacture includes 400 V, 25 MVA circuit-breakers and combined switch-fuse units. Johnson & Phillips were the contractors for the cabling and the electrical installation was carried out by Rashleigh Phipps & Co., Ltd. The three main cooling water pumps were supplied by Sigmund Pumps, Ltd., and the cooling towers were built by Head Wrightson Processes, Ltd.

The consulting engineers are Messrs. McLellan & Partners in association with Messrs. Merz & McLellan.

## Fuel Economy in Steel Making

IN a paper presented at the Fuel Efficiency Exhibition at Olympia on 1st October, Mr. R. P. Towndrow (Colvilles, Ltd.) showed that the quantity of coal used in steel making, in Great Britain, 30 million tons a year, was about the same as it was 35 years ago but that it produced nearly 2½ times the amount of steel. Over a similar period more than 1½ times the amount of iron was made, using less coal and coke. Apart from numerous technical improvements, including advanced instrumentation and automatic control, a principal factor in heat economy had been the integration of the various manufacturing processes, which if complete would have enabled all the electricity required to be supplied from the works. Last year 3,300 million kWh was generated locally and 4,700 million kWh was purchased, the aggregate being equal to nearly one-ninth of the total produced by public supply power stations in 1956.

## Cold-Rolled Steel Sections

THE dimensions, weights and geometric properties of a basic range of cold-rolled steel sections are specified in the new British Standard 2994: 1958. The sections are of the type formed by cold rolling from steel strips and the sizes specified are those in common production. The eleven tables deal with equal and unequal angles, inwardly-lipped and outwardly-lipped channels—and with tees and compound sections made up from them. They are preceded by a number of general requirements and by a clause which deals fully with the subject of tolerances.

Copies of B.S. 2994: 1958 can be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 8s 6d.

# Electrical Manufacture in Australia

*Continued Expansion and Competition*

IN this country Australia is normally thought of as one of the principal markets for British exports, and the importance of her own manufacturing industry tends to be overlooked. In fact, since the war industrial development in Australia has been on an impressive scale, and this has resulted not only in greatly increased production, but in a marked strengthening of the industrial structure, an expansion of the range of goods manufactured, and a significant improvement in design and quality. At the same time, new and more efficient machines, with new processes and improved techniques, have enabled a higher output to be achieved at lower cost, particularly in terms of labour. A measure of this expansion is given by the growth in factory employment from 820,000 in 1947-48 to the present figure of 1,030,000.

According to the April, 1958, issue of *Survey of Manufacturing Activity in Australia*, published recently by the Commonwealth Government, the slowing down in the rate of progress during the past eighteen months was perhaps "inevitable following the rapid and substantial development of the previous ten years." During the six months to April, 1958, production again increased and the firmness of current demand in most sections of the Australian economy reflects a sustained level of expenditure for both consumption and investment. While larger firms are continuing with their investment programmes, small firms are showing a more cautious attitude. This is attributed in some industries to the existence of adequate capacity, and in others to reduced demand and uncertainty regarding competition from imports. Nevertheless there is little indication in the reports obtained from manufacturers that the present high level of activity will not continue, though trading conditions will remain very competitive. Details of the position regarding selected electrical goods are given below.

## Plant, Equipment and Machinery

*Motors.*—More than 80 per cent of the electric motors sold in Australia are made locally by about 40 firms employing between them 2,800 people. Motors up to 800 h.p. are made and the greater proportion of production is of a.c. motors, particularly single-phase fractional horsepower units. The range includes fan-cooled, flameproof, and explosion-proof motors. Where time and economy are essential, large units that would have to be "custom-built" in Australia are obtained from stock abroad.

In the year ended April, 1957, 912,159 f.h.p. and 55,789 larger motors were made and 1,148 of these worth £65,000 were exported. The output of f.h.p. motors was 65 per cent higher than five years previously while that of larger motors was 2 per cent lower. Output of both types has increased during the past year and the present level of production, which is below the peak of three years ago, is thought likely to continue, and is considered satisfactory. Larger motors will be built as the market develops. Production capacity in use generally exceeds 75 per cent in New South Wales and Victoria, and some of the larger firms are working at 100 per cent capacity with overtime. In other States, the capacity worked is mostly below 75 per cent. Exports are mainly to New Zealand, South Africa and the Pacific Islands, but are restricted by the high costs of production.

*Transformers* for electric power transmission and distribution are made in all the States, and since the war manufacturers have enlarged their productive capacities and range of products to meet the increasing demand. However, during the six months ended April, 1958, the intake of new orders was, in general, at a lower rate than production, and most firms had only a few months' work on hand. Competition was very keen and, according to some manufacturers, prices were forced down close to uneconomic levels. With the increasing demand for electric power, it is thought that the demand for transformers must eventually again turn upwards, perhaps sharply. The industry would benefit if a means could be devised of moderating fluctuations in demand, and a standardisation of the technical requirements of different States would enable savings to be made in manufacturing costs. Some of the larger companies are contemplating major development programmes, and there has been a general change-over to grain-oriented low-loss core steel.

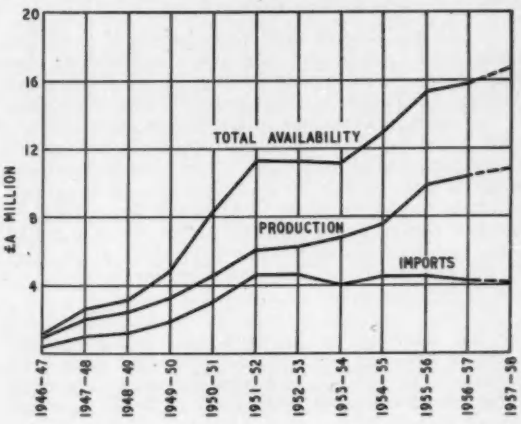
*Electrical Control Gear.*—Australian manufacturers produce a wide range of high-voltage and most types of low-voltage electrical control gear for supply authorities and industry. Output has increased rapidly since the war until it is now of the order of £11 million a year, equivalent to two-thirds of the total demand. Imports, mainly from the United Kingdom, supply the balance.

Many imports comprise equipment beyond the scope of Australian manufacturers, but about half are in direct competition with local products. Sales of overseas equipment are said usually to result from lower price, customer preference, or the inclusion of special features not available in local products. The relation of production and imports is illustrated in the graph.

Exports amount to about £200,000 a year, and the prospects appear reasonably good. Most of the business is in low-voltage equipment, but there have been some "determined efforts, with reasonable success," to secure orders in New Zealand for high voltage equipment.

The industry comprises about thirty-five manufacturers

*Australian production and imports of electrical control gear*



of whom eleven account for 50 per cent of the output. The remaining firms produce the simpler types of industrial gear. During the twelve months to April, 1958, there was a slight upward trend in production and the industry as a whole was operating at 85 per cent capacity. There is, however, concern whether the intake of new orders will be adequate to maintain existing rates of output. Some manufacturers have orders in hand for twelve months' production, others for only two. In the long term, output is expected to increase both of existing lines and of new products introduced by Australian companies, manufactured under licence, or introduced by subsidiaries of overseas companies.

*Wires and Cables.*—Production is now undertaken by twenty-two manufacturers employing nearly 4,000 people, and the industry can supply most types of wires and cables, except certain of the larger special power and telecommunication cables. Capacity is in excess of local requirements and the industry is endeavouring to develop exports. Plastics cable manufacturers are operating at 90 to 100 per cent capacity and other producers at about 75 per cent. Competition is keen and has led to some lowering of prices. Contrary to the general trend, instances are reported of an increase in orders of up to 15 per cent, and most manufacturers questioned expected an increased demand this year for all except the rubber and textile covered types. During the six months to April, 1958, some £500,000 was spent on capital investment and considerable replacement of obsolete plant is envisaged this year.

Exports of wires and cables rose by 24 per cent in 1956-57 to £490,706, but the figure for "covered cable and wire" for the last nine months of 1957 was 41 per cent below that of the corresponding period of the previous year. New Zealand is the main market. Imports of wires and cables in 1956-57, at £940,009, were 67 per cent below the previous twelve months.

## Durable Consumer Goods

The industries producing durable consumer goods were among the first to respond to the post-war growth of the Australian economy, and their expansion over the past decade has been far greater than the average for all manufacturing industry. This expansion has resulted in a substantial replacement of imports, and the proportion of the market supplied by local manufacturers has risen from 66 per cent in 1938-39 to a present figure of 88 per cent. The hire-purchase finance made available in the first quarter of 1958 for household goods, particularly television receivers, was 59 per cent higher than in the same period last year, and it is calculated that the average hire-purchase debt per head of population is now nearly £30, or three times the average figure in 1953.

*Refrigerators.*—More than three-quarters of Australian homes have a refrigerator, and local manufacturers have more than sufficient capacity to meet the present demand. Although the industry is mainly Australian owned, a number of manufacturers produce under licence from overseas manufacturers. The twelve principal firms account for 85 per cent of total production. Output has declined substantially since the peak production of 280,000 in 1954-55 and some producers believe that demand this year will be between 180,000 and 200,000 units; but even if it is well above this figure competition will continue to be keen. During the first quarter of 1958 sales were over 15 per cent higher than in the same period of last year.

The sealed-unit type is almost universally preferred and the few absorption refrigerators now made are mainly kerosene operated units for non-electrified areas. To promote new sales and replacement demand, reliance is being placed on new models, many of larger capacities. The competitive state of the industry has prevented any rise in prices over the past twelve months and has encouraged consolidation rather than expansion. Imports of refrigerators in 1956-57 were worth £27,382, about half the value for the previous twelve months. Exports, valued at £203,021 in 1956-57, were mainly to New Guinea and Papua, with small quantities to New Zealand and markets to the near north. Manufacturing costs, freight charges, and overseas competition have made it difficult for manufacturers to increase the volume of export business.

*Washing Machines.*—There are some twenty-five firms, including four major producers, engaged in making and assembling washing machines. Some firms produce under licence and others are controlled by overseas companies. Last year 157,176 units were produced; this was rather more than in 1956 but still below the 1955 figure. Sales are now at a slightly higher level than last year and orders are coming forward at an encouraging rate. Productive capacity in use varies for different firms between 40 and 100 per cent. Between 1955 and 1957 the value of imports dropped from £560,877 to £28,170. Australian washing machines are exported in small quantities to New Zealand and adjacent islands.

It is estimated that only about 50 per cent of Australian homes supplied with electricity have washing machines, and there is a growing replacement demand for new and improved models. Increasing market penetration has nevertheless been difficult and competition is accordingly keen. As a result there are frequent changes of models and a full range of colours has been introduced. While demand has been concentrated on the agitator-wringer type of machine, automatic and semi-automatic units are now being introduced. As productive capacity has already been expanded beyond existing demand, capital expenditure is limited to normal plant replacement and tooling for new models.

*Television Receivers.*—The greatest development has been in the manufacture of television receivers, and in the first quarter of this year production was double that in the first quarter of 1957. Since manufacture started two years ago, over 325,000 sets have been produced, and it is expected that 250,000 sets will be produced this year and 300,000 in 1959. Even this quantity is well within the present manufacturing capacity. Over 60 per cent of the sets now being made have 21in screens. Up to March this year the value of imported components had exceeded £18 million, but manufacturers are looking increasingly to local sources of supply, and some sets are now nearly 100 per cent Australian. There are twenty receiver manufacturers, who employ between them 5,000 to 6,000 people, and they are supported by eighteen component manufacturers.

---

## Electronic Valve Bases, Caps and Holders

THE British Standard 448, first introduced in its current loose-leaf form in 1953, consisted of thirty sections. The publication specifies such physical requirements of bases and caps of electronic valves (and in some cases their outlines and associated holders and connectors) as are necessary for mechanical compatibility and satisfactory electrical contact.

Four new sections, and one new replacement section, for B5E:1953, are now available. Their numbers and titles are:—B5E, base (Issue 2); B7G/F, base, valve outline; B8D, base, base pin position gauge valve outline; B8D/F, base, valve outline and B9A/F, base, valve outline.

Copies of these sections of B.S. 448 can be obtained from the British Standards Institution, 2, Park Street, London, W.1. Price 2s each section.

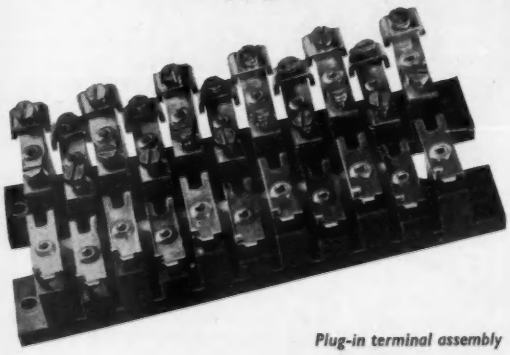
# Photo-Electric Controls

ALTHOUGH the light-sensitive property of selenium was discovered 85 years ago, it was not until 1927 that the first practical photo-electric cell was invented. The Radiovisor Company was formed to exploit its commercial possibilities. The first application, which was for the control of street lighting, used a sensitive relay operated directly by the selenium cell. This sensitive relay in turn operated a secondary relay which controlled the lighting.

The applications were, however, limited until the advent of the thermionic valve in the early '30s. This enabled the output of the selenium cell to be amplified to perform other functions such as smoke density indication. But more important, it enabled the photoemissive cell to be used and photo-electric control was applied to numerous mechanisms. There was, however, considerable opposition to the use of electronic equipment on the part of works engineers until the last war.

In the course of that war, the company's factory was destroyed and it was only two years ago that Radiovisor Parent, Ltd., moved from temporary premises to Stanhope Works, High Path, London, S.W.19. The new premises were equipped on modern lines to suit the requirements of electronic equipment manufacture. The company's facilities include an up-to-date machine shop, a tool room and prototype and development laboratories.

*Relay unit of a photo-electric control unit showing the chassis being plugged in*



*Plug-in terminal assembly*

*Section of the Radiovisor assembly department*

After moving to the new factory, the company took the opportunity to redesign completely their whole production range. The basic design of most units now centres round the plug-in chassis which allows a faulty unit to be replaced in a few minutes by a works electrician without the need to disconnect the terminals.

Due to the wide range of equipment made by the company all units are produced in small batches. Some time ago it was decided to design each unit specifically for its particular application and not to concentrate production on a few basic designs which could be roughly tuned to particular applications. This has been done without any price advances.

Most units are assembled in three distinct operations, namely, chassis assembly, components sub-assembly on a tag board and the final assembly of these two items. All these operations on popular units, are carried out by girls who work from samples of the units and not by following complicated wiring diagrams. Testing can be carried out by unskilled labour on special test rigs for the more common units.

One of the most popular units produced by the company is the press brake-guard which conforms to the recommendations on the fencing of presses given in a report of the Factories Department of the Ministry of Labour and National Service. This safety device overcomes the limitations of mechanical guards which invariably restrict the usefulness of the press and slow down production. It stops the press if a curtain of light parallel to the gap, is interrupted by the operator. A monitoring device is incorporated to check the working of the guard after each operating cycle of the press.

Another item of interest, with particular application to power station operation, is the Radiovisor flame failure protection for oil, gas and pulverised fuel burners. Among other applications of photo-electric control manufactured by the company are counting and batching, bunker level control, conveyor controls, burglar alarms, heat temperature control and smoke density indication and alarm. The company also manufactures electronic timers and motor speed control equipment.

# NEW ELECTRICAL EQUIPMENT

## Portable Cable Tester

A cable test set providing facilities for checking the continuity and insulation of multi-core cable looms from one end of the cable run has been introduced by DE HAVILLAND PROPELLERS, LTD., Hatfield, Hertfordshire. The far end of the cable being checked is terminated by a small unit and the test is initiated by a press-button, the instrument automatically selecting up to 25 conductors in turn. A window is illuminated by a red light if a failure occurs, in which case the selector stops at the faulty core, and successful completion of a test sequence is indicated by the extinguishing of a separate indicator lamp. A suitable coupler enables the test set outlet to be connected to any cable, special adaptors being used for cables having more than 25 conductors. Standard service style headsets may be used with an intercommunication amplifier incorporated in the instrument when the termination unit is

*De Havilland Propellers portable cable tester*

more conveniently attached by a second operator.

Power is supplied by a lightweight battery of sufficient capacity for about sixteen hours of normal use, the power consumption being less than 30 W. A charging unit is available which can be incorporated in the fibreglass carrying case, the battery being fully charged in four hours with no risk of overcharging if the equipment is left; a meter indicates the state of charge. For bench use an a.c. power unit operating from 110 V to 250 V at 45-65 c/s is available.

Five conductors a second can be dealt with when checking continuity, and for insulation testing 500 V d.c., rendered non-lethal by a current limiting device, is applied to each conductor for 6, 15 or 30 sec as required, each conductor being checked to all others and earth. The tester is housed in a case 11in by 6in by 8½in and weighs 19 lb.

## Voltage Tester

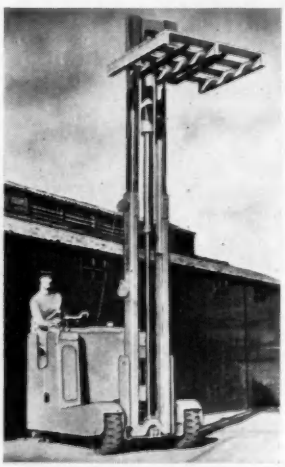
A fixed prod voltage tester developed from their Model 54 has been introduced by the electrical equipment division of the MARTINDALE ELECTRIC CO., LTD., Westmorland Road, London, N.W.9. The body of the tester is constructed from high impact strength moulded plastic having good insulation properties, and incorporates one of the test probes and a magnifier to aid in the reading of the indicating disc.

The high resistance coil is wound on a moulded nylon bobbin, and the coil ends are attached to terminals into which the probe lead is secured, ensuring that tension on the lead cannot affect the coil. The probe points are normally covered by spring-loaded sheaths which are pushed back when the probes are held against the surface being tested. A fuse rated for ½ A is fitted to the search probe in series with a 68 Ω current limiting resistor, giving protection should a short-circuit occur. The tester is priced at £2 17s 9d and is available from stock.

## Reach Fork Lift Truck

A lifting truck (Model E755) on which the mast with loaded pallet can be moved forwards and backwards has been introduced by WESSEX INDUSTRIES (POOLE), LTD., Dolphin Works, West Street, Poole, Dorset. The truck is capable of raising a load of 30 cwt at 24in centres to a height of 6ft with the telescopic mast lowered or 12ft with the mast fully extended. The mast can be retracted 24in from the fully forward position, bringing the load well within the wheel base for stability and safety, and the power unit and drive wheel turn through 180 degrees, allowing extreme manœuvrability.

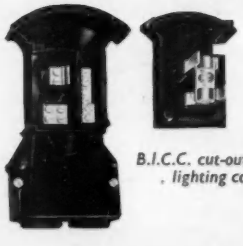
A heavy duty series wound traction motor is used in the drive unit and a similar motor drives the gear type oil pump on the hydraulic system for the lifting rams. An Exide 24 V 500 Ah traction duty battery, fitted in two steel lift-out containers, is charged by a Westinghouse Type VZ 12/50 charger.



*Wessex Model E755 lifting truck*

## Street Lighting Cut-outs

An insulated double-pole fuse box for use in street lighting columns has been designed and marketed by BRITISH INSULATED CALLENDER'S CABLES, LTD., 21, Bloomsbury Street, London, W.C.1. The three-part moulded fire-resistant unit comprises a base, sealing chamber cover and a front cover which is also the fuse carrier. One 5, 10 or 15 A high-breaking-capacity fuse link conforming to B.S. 88 : 1952 with a duty rating of category 440AC4 or a 30 A rated fuse conforming to the dimensions included in B.S. 1361 : 1947 can be fitted. Knockouts are provided for cable entries and exits and the box can be supplied with terminals for one or two twin incoming cables up to 0·0225 sq in of either the paper insulated lead covered or p.v.c. single wire armoured types, entering the sealing chamber



*B.I.C.C. cut-out for street lighting columns*

through rubber bushes or brass wiping glands. Two single v.i.r. or p.v.c. insulated outgoing cables up to 7/·029in can be used.

## High Frequency Voltmeter

The latest addition to the range of voltmeters manufactured by MARCONI INSTRUMENTS, LTD., St. Albans, Hertfordshire, is a vacuum tube voltmeter, type TF 1041B, with a frequency range extending to 1,500 Mc/s. Measurement ranges are 25 mV to 300 V a.c. at frequencies from 20 c/s to 1,500 Mc/s, 10 mV to 1,000 V d.c., and resistances from 0·02Ω to 500 MΩ. Multipliers can be supplied for up to 2 kV a.c. and 20 kV d.c. Measurement of resistance and d.c. voltages is simplified by the dual-purpose d.c. probe with its finger-tip V/Ω selector which, when set to V, introduces an isolating resistor to shield the circuit under test from the effects of probe-lead capacitance, and on all d.c. ranges a centre-zero facility is available to aid the precise determination of null point in bridges and discriminators.

The cylindrical probe unit used for a.c. measurements weighs only 1½ oz and houses a disc-seal diode rectifier with a resonant frequency of 3,000

*Marconi high frequency voltmeter*

Mc/s and low inter-electrode capacitance, making possible a frequency response flat to within 1 dB up to 1,000 Mc/s and showing a rise of less than 3 dB at 1,500 Mc/s.

The d.c. section of the voltmeter is essentially a two-stage impedance convertor, each stage embodying two cathode followers with heavy degeneration between the input points and the moving coil meter across the output, ensuring accuracy virtually independent of valve characteristics. The filament supply to all valves is stabilised, and the effects of meter temperature coefficient are offset by a series thermistor.

### Insulation Tester

A spark tester using electronic techniques to detect insulation faults in wires and cables during production or reeling operations has been introduced by the ADDISON ELECTRIC CO., LTD., 10/12, Bosworth Road, London, W.10.

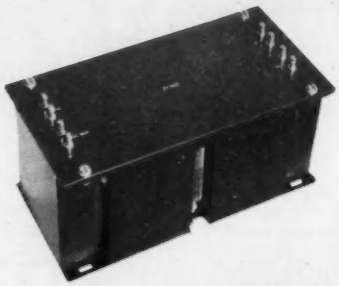
The equipment comprises a control cabinet connected by a low voltage cable up to 30ft in length to a small case containing the high voltage generator and test electrode. An electronic storing circuit is incorporated, capable of operating a conventional relay and magnetic counter from the very short pulses received on the passage of a fault at wire speeds up to 60,000 yd/hr. A signal response speed of 1 $\mu$sec permits the use of an electrode only 3in long, enabling closely spaced faults to be resolved without the risk of multiple counting.

A two-way switch in the control cabinet selects the method of signal relay operation in either a latching mode requiring the pressing of a push-button for signal cancellation, or a self-cancelling mode in which each fault operates the relay once.

In either mode the number of breakdowns is recorded by a magnetic counter having a maximum speed of 800 faults/min or, if required, an electronic counter capable of registering 3,000 faults/min. A high frequency test voltage is used, continuously variable between 0 and 25 kV, and the equipment, which has a power consumption of 45 W, is designed for connection to a 110 or 200-250 V, 40-60 c/s a.c. supply.

### Saturable Reactors

A range of linear saturable reactors for up to 100 kVA at unity power factor with a wide range VA output and extremely low d.c. control power have been developed by HADDON TRANSFORMERS, LTD., Masons Avenue, Wealdstone, Harrow, Middlesex. These naturally air cooled reactors



*Haddon saturable reactor*

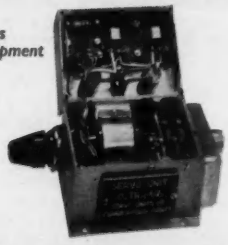
are available in open or enclosed construction, processed to meet any climatic condition. A small d.c. control current in a separate coil on the reactor magnetic circuit varies the a.c. permeability, the amount of d.c. power required being relatively small compared to the a.c. power under control, a 10 kVA reactor having a d.c. power consumption of only 20 W. In cases where limited d.c. control power is available a range of magnetic amplifiers can be supplied which, when associated with the saturable reactors, are capable of controlling power up to 100 kVA. These amplifiers may be adapted to suit individual applications.

### High Speed Servo

Two servo units designed to provide an output shaft displacement precisely related to an input voltage and having a rapid response with angular rates up to 400 deg per second have been produced by SERVO UNITS, LTD., Farnborough Road, Farnborough, Hants.

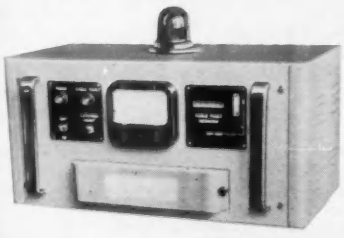
Each unit consists of a light alloy box containing a d.c. electric motor driving a stainless steel shaft through

*Servo Units Type O.TR equipment*



a train of spur gears. The motor is fed via power transistors controlled either from a d.c. transistor feedback amplifier or a two-valve thermionic amplifier supplied from a transistor h.t. supply, all fed from the original 6 or 12 V d.c. supply. Mains a.c. supply units are available if required.

The smallest servo has a stalled torque of 1 lb-ft with a response rate of 35 deg/sec, the corresponding figures for the larger unit being 5 lb-ft and 50 deg/sec, and no damage to either motor or transistors is caused if the unit is stalled. Various gear ratios are available giving up to twenty times the response speed with proportionately less torque.



*Addison insulation tester*

## CATALOGUES AND LISTS

**CABLE ACCESSORIES.**—Leaflet giving particulars and illustrations of brass cable glands and cable sealing chambers produced by the company.—**Peppers of Woking, Ltd.**, Stanhope Road, Camberley, Surrey.

**CABLES.**—Leaflet (451C) listing the range of winding wires and strips, plastic insulated and rubber insulated cables and flexibles produced by the company and a brochure (Micro.1) dealing with "Concord" microphone cables.—**Concordia Electric Wire & Cable Co., Ltd.**, Long Eaton, Nottingham.

**CLIPPING MACHINES.**—8-page booklet illustrating and describing uses for the company's range of industrial clipping machines, including applications in the carpet, boot and shoe, and brush industries.—**Wolseley Engineering, Ltd.**, Wolseley Works, Electric Avenue, Witton, Birmingham, 6.

**DOMESTIC APPLIANCES.**—Broadsheet on the "Hi-Dry" clothes dryer and airer and a folder showing the company's range of electric space heaters, including convectors, reflector fires and cupboard heaters.—**L. G. Hawkins & Co., Ltd.**, 30/35, Drury Lane, Kingsway, London, W.C.2.

**MEASURING INSTRUMENTS.**—Illustrated folder (118) giving particulars of a range of electrical measuring instruments, including various types of potentiometers, pH meters and Wheatstone bridges, etc.—**Doran Instrument Co., Ltd.**, Stroud, Glos.

**SERVO COMPONENTS.**—4-page leaflet summarising the range of Pullin-Kearfott and Pullin servo components and instrument motors.—**R. B. Pullin & Co., Ltd.**, Phœnix Works, Great West Road, Brentford, Middlesex.

**TELEGRAPH TRANSMITTER.**—Brochure describing Type HS92 400-500 W frequency-shift telegraph transmitter for point to point services.—**Marconi's Wireless Telegraph Co., Ltd.**, Marconi House, Chelmsford, Essex.

***Financial Section***

# STOCKS and SHARES

SHARES of the cable manufacturing companies have again been attracting much attention in the electrical sections of the industrial market. Activity was centred upon the shares concerned in Associated Electrical Industries' offer for the capital of W. T. Henley's Telegraph Works Co., Ltd., whose discussions for a possible merger with Johnson & Phillips were terminated about a month previously. Apart from this event, interest in the cable group has continued to be encouraged by the steadier behaviour of copper prices, in which last year's slump did much damage to the industry's earnings, and by the news of the round-the-world cable link proposed at the Montreal conference. Particulars are expected to be published next Monday (13th) as a preliminary to the marketing of Pyrotenax shares.

## A.E.I. and Henley's

A rise of 4s, to 18s 3d, in the price of W. T. Henley's Telegraph Works 10s shares followed immediately upon the preliminary announcement of the proposed merger with Associated Electrical Industries, and left no doubt about the degree of satisfaction with which the terms of the share-exchange offer were received. A.E.I. £1 shares were subsequently quoted at 52s 6d, so that the offer of 36 of these shares for every 100 Henley's shares put a value of just under 19s on the latter. Henley's shareholders who accept would receive the recently declared 2½ per cent interim dividend, and a capital payment of 3d. per share might be made before the transfer. They would rank for all A.E.I. dividends thereafter. Considering that the 11½ per cent dividend paid by Henley's for 1957 was not entirely covered by the earnings of that year, and assuming the maintenance of the A.E.I. dividend at a total of 15 per cent, the proposal has received favourable comment also from the income point of view. Details are expected to go out shortly to shareholders.

## Price Changes

Among other price movements in the group of cable shares, London Electric Wire added 6d to the previous week's rise of 5s 9d which followed the announcement of an increased interim dividend, and a renewal of activity in Enfield Cables raised the price by 1s 6d, to 17s 6d, with transactions recorded up to 18s 9d. Of the many improvements shown elsewhere in the electrical lists, some of the most notable were those of 3s 9d to 46s 3d in Brook Motors, 2s to 65s in Chloride Electrical, 5s 6d to 44s 3d in Falk Stadelmann, 1s to 17s 9d in Switchgear & Cowans, 3s 9d to 57s 6d in British Tabulating Machine and 6d to 12s 3d in Crompton Parkinson. A further rise of 1s 6d, to 32s 6d, in British Electric Traction "A" shares was part of a general advance in investments with commercial television associations. E.M.I. were very firm in advance of the annual results. British

## *Price Changes in*

| Company or Board | Nom. Value | Middle price 6th Oct. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield% | 1958 Highest | 1958 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Gilt-edged Stocks* | | | | | | £ s d | | |
| Brit. Elec. 1968/73 | 100 | 76½ | +½ | 3 | 3 | 3 18 6 | 76½ | 72 |
| Brit. Elec. 1974/77 | 100 | 73½ | +1 | 3 | 3 | 4 1 9 | 73½ | 68½ |
| Brit. Elec. 1976/79 | 100 | 78½ | +½ | 3½ | 3½ | 4 9 3 | 78½ | 72 |
| Brit. Elec. 1974/79 | 100 | 87 | +1 | 4½ | 4½ | 4 17 9 | 87½ | 82½ |
| *Overseas Electric Supply* | | | | | | | | |
| Calcutta Elec. | £1 | 17/-x.d. | | 6·8† | 7† | 8 4 9† | 17/6 | 15/- |
| East African Power | £1 | 22/6 | | 7½ | 8 | 7 2 3 | 22/6 | 17/6 |
| Nigerian Elec. | £1 | 15/- | | 10 | 10 | 13 6 9 | 17/- | 12/6 |
| Perak Hydro-Elec. | £1 | 15/- | | 10 | 12½ | 16 13 3 | 15/6 | 13/6 |
| *Electrical Shares* | | | | | | | | |
| Aberdare Holdings | 5/- | 13/3 | | 17½ | 17½ | 6 12 0 | 13/9 | 9/9 |
| Aerialite | 1/- | 8/- | | 48 | 51½ | 6 8 9 | 8/- | 5/1 |
| Allen, W. H. | £1 | 40/- | +1/3 | 10 | 11 | 5 10 0 | 40/- | 32/9 |
| Anglo-Portuguese Tel. | £1 | 29/3 | | 8 | 9 | 6 3 0 | 29/3 | 19/9 |
| Aron Elec. Ord. | £1 | 55/- | | 15 | 15 | 5 9 0 | 57/6 | 53/- |
| Assoc. Elec. Ord. | £1 | 52/6 | | 15 | 15 | 5 14 3 | 53/9 | 46/6 |
| Automatic Tel. & El. | £1 | 70/- | | 17 | 17 | 4 17 3 | 70/- | 57/- |
| Babcock & Wilcox | £1 | 54/6 | +4/- | 15 | 13‡ | 4 15 6 | 54/6 | 41/9 |
| Bakelite | 10/- | 22/6 | +6d | 15 | 15 | 6 13 3 | 22/6 | 17/6 |
| Baldwin, H. J. | 2/- | 2/9 | | 20 | 20 | — | 3/9 | 2/6 |
| Berry's Electric | 5/- | 7/9 | | 10 | 10 | 6 9 0 | 8/6 | 5/9 |
| British Aluminium | £1 | 48/3 | +9d | 12 | 12 | 4 19 6 | 55/- | 37/- |
| Brit. Elec. Traction: Def. Ord. "A" | 5/- | 32/6 | +1/6 | 25 | 25 | 3 17 0 | 33/- | 19/6 |
| B.I. Callender's | £1 | 46/- | −6d | 12½ | 12½ | 5 8 9 | 47/- | 38/9 |
| B.I. Callender's 6% Pref. | £1 | 20/- | | 6 | 6 | 6 0 0 | 20/3 | 19/- |
| British Tabulating | £1 | 57/6 | +3/9 | 9 | 10 | 3 9 6 | 57/6 | 38/6 |
| British Thermostat | 5/- | 32/6 | +6d | 25 | 30 | 4 12 3 | 32/6 | 19/9 |
| British Vac. Cleaner | 5/- | 4/3x.c. | +3d | 10 | 10 | 5 17 9* | 4/3 | 2/3 |
| Brook Motors | 10/- | 46/3 | +3/9 | 25 | 25 | 5 8 0 | 46/3 | 33/3 |
| Bulgin, A. F. | 1/- | 7/- | +9d | 40 | 45 | 6 8 6 | 7/- | 4/7 |
| Bulpitts | 5/- | 8/9 | | — | 12½‡ | 7 2 9 | 8/3 | 7/3 |
| Burco Dean | 5/- | 9/9 | | 20 | 22½ | 7 13 9* | 10/- | 7/9 |
| Cable & Wireless: Ord. | 5/- | 12/- | +3d | 10 | 10‡* | 4 3 3 | 12/- | 8/- |
| 4% Loan | 100 | 94 | | 4 | 4 | 4 5 0 | 94½ | 89 |
| Chloride El. Storage "A" | £1 | 65/- | +2/- | 17½ | 17½ | 5 7 9 | 65/- | 55/6 |
| Clarke Chapman | £1 | 63/9 | | 27½ | 27½ | 4 6 3* | 72/6 | 55/- |
| Cole, E. K. | 5/- | 17/3 | +3d | 17½ | 17½ | 5 1 6 | 18/- | 15/3 |
| Cossor, A. C. | 5/- | 4/9 | −3d | 2½ | Nil | Nil | 6/- | 4/4 |
| Crabtree | 10/- | 31/- | +1/- | 20 | 20 | 6 9 0 | 31/- | 24/4 |
| Crompton Parkinson Ord. | 5/- | 12/3 | +6d | 16 | 16 | 4 7 0* | 12/3 | 8/3 |
| De La Rue | 10/- | 27/3 | +1/9 | 35 | 17½* | 6 8 6 | 27/3 | 20/9 |
| Decca "A" | 4/- | 28/9 | −6d | 43½ | 43½ | 6 1 9 | 29/3 | 21/3 |
| Desoutter | 5/- | 16/6 | | 32½ | 18½* | 5 13 9 | 16/6 | 13/6 |
| Dewhurst | 2/- | 9/- | +6d | 16½ | 20 | 4 9 0 | 9/- | 6/9 |
| Dictograph Tel. | 2/- | 7/- | | 20 | 20* | 5 14 3 | 7/- | 4/7 |
| Dubilier Condenser | 1/- | 3/6 | | 30 | 20* | 5 14 3 | 4/3 | 3/1 |
| Duport | 5/- | 10/- | +3d | 25 | 25 | 6 5 0* | 10/- | 7/9 |
| E.M.I. | 10/- | 43/- | +2/- | 15 | 15 | 3 9 9 | 43/- | 27/6 |
| Electrical Components | 5/- | 9/9 | +9d | 12½ | 12½ | 6 8 3 | 9/9 | 7/- |
| Elec. Construction | £1 | 26/9 | +6d | 8½ | 8½ | 6 9 6 | 26/9 | 21/- |
| Elliott-Automation | 5/- | 16/9 | | — | 10‡ | 2 19 9 | 17/- | 11/6 |
| Enfield Cable Ord. | £1 | 17/6 | +1/6 | Nil | 2½ | 2 17 3 | 18/9 | 10/9 |
| English Electric | £1 | 58/9 | | 14 | 14 | 4 15 3 | 58/9 | 44/- |
| English Electric 3½% Pref. | £1 | 12/6 | | 3½ | 3½ | 6 0 0 | 12/6 | 11/9 |
| Ericsson Tel. | 5/- | 24/9 | +6d | 22‡ | 12*† | 2 8 6† | 24/3 | 17/6 |
| Ever Ready | 5/- | 21/- | +1/- | 37½ | 20* | 4 15 3 | 21/- | 13/9 |
| Falk Stadelmann | £1 | 44/3 | +5/6 | 17½ | 17½ | 8 6 9 | 44/3 | 35/- |

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Vacuum Cleaner shares were quoted ex-the 100 per cent scrip issue.

### Morphy-Richards Dividend

The 4s shares of Morphy-Richards were dealt in at about 6d above the official quotation of 17s 6d after news of the record trading profit of £656,000, and the maintenance of the dividend at a total of 20 per cent for the year ended last June. Heavier charges for taxation and depreciation leave the net surplus of £218,000 only a little above the 1956–57 level, but it provides well over two-fold cover for the amount distributed in dividend. A yield of about 4½ per cent at the present price of the shares is below the average in the industrial market and no doubt anticipates, to some extent, the benefits expected to accrue from this year's relaxation of the purchase-tax and hire-purchase regulations affecting domestic appliances of the type produced by the Morphy-Richards group.

## *Electrical Investments*

| Company or Board | Nom. Value | Middle price 6th Oct. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % £ s d | 1958 Highest | 1958 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Electrical Shares—continued* | | | | | | | | |
| G.E.C. Ord. | £1 | 38/9 | +1/3 | 12½ | 10 | 5 3 3 | 38/9 | 29/3 |
| G.E.C. 6½% Pref. | £1 | 21/- | | 6½ | 6½ | 6 3 9 | 21/3 | 20/3 |
| General Cables | 5/- | 9/9 | +6d | 30 | 24 | — | 11/9 | 8/3 |
| Greenwood & Batley | £1 | 50/6 | | 17½ | 20 | 7 18 6 | 50/6 | 45/- |
| Hackbridge Holdings | 5/- | 13/9 | +6d | 20 | 20 | 7 5 6 | 14/3 | 7/6 |
| Hackbridge & Hewittic | 5/- | 14/3 | +6d | 20 | 20 | 7 0 3 | 14/3 | 9/7 |
| Head Wrightson | 5/- | 21/3 | −6d | 22½ | 17½* | 4 2 3 | 22/3 | 16/9 |
| Heatrae | 2/- | 7/- | | 15 | 20 | 5 14 3 | 7/- | 4/- |
| Henley's | 10/- | 18/3 | +4/- | 11½ | 11½ | 6 6 0 | 18/6 | 10/6 |
| Holophane | 5/- | 15/3 | +6d | 30 | 37½ | 7 7 6* | 15/3 | 12/6 |
| Hoover | 5/- | 49/6 | | 50 | 50 | 5 1 0 | 49/6 | 31/- |
| I.C.I. | £1 | 34/- | +6d | 10 | 12 | 4 14 3* | 35/- | 23/9 |
| Intl. Combustion | 5/- | 27/6 | | 22½ | 25 | 4 11 0 | 27/6 | 19/3 |
| Johnson & Phillips | £1 | 20/- | | 10 | 5 | 5 0 0 | 25/- | 15/- |
| Lancashire Dynamo | £1 | 40/- | | 11 | 11 | 5 10 0 | 40/- | 28/6 |
| Laurence Scott | 5/- | 16/9 | +6d | 15 | 15 | 4 9 6 | 16/9 | 12/6 |
| Lister, R. A. | £1 | 29/6 | +2/- | 10 | 10 | 6 15 6 | 29/6 | 23/- |
| London Elec. Wire | £1 | 54/3 | +6d | 12½ | 12½ | 4 12 3 | 54/3 | 39/6 |
| Lucas, J. | £1 | 39/6 | | 7½ | 7½ | 3 16 0 | 40/- | 27/9 |
| Marconi Marine | £1 | 35/6 | +6d | 10 | 10 | 5 12 9 | 35/6 | 29/- |
| Marryat & Scott | 2/- | 7/6 | | 35 | 37½ | 5 0 0* | 7/7 | 5/3 |
| Mather & Platt | £1 | 45/9 | +3/3 | 15 | 15 | 4 7 6* | 45/9 | 29/6 |
| Metal Industries | £1 | 39/6 | −6d | 9 | 14 | 7 1 9 | 40/6 | 22/9 |
| Midland Elec. Mfg. | £1 | 50/- | | 12½ | 12½ | 5 0 0 | 50/- | 44/- |
| Morphy-Richards | 4/- | 17/6 | −6d | 20 | 20 | 4 11 6 | 19/- | 14/6 |
| Murex | £1 | 50/3 | +1/3 | 20 | 17½ | 6 19 3 | 58/3 | 48/- |
| Newman Ind. | 2/- | 2/3 | | 10 | 10 | 8 17 9 | 2/9 | 2/3 |
| Oldham & Son | 1/- | 3/- | | 17½ | 17½ | 5 16 9 | 3/- | 2/3 |
| Parsons, C. A. | £1 | 48/9 | | 8½ | 7½* | 3 1 6 | 53/6 | 43/- |
| Plessey | 10/- | 64/3 | +1/- | 30 | 30 | 4 13 6 | 64/3 | 55/- |
| Pye "A" Deferred | 5/- | 13/6 | | 12½ | 12½ | 4 12 6 | 14/6 | 10/- |
| Reyrolle | £1 | 80/- | | 17½ | 17½ | 4 7 6 | 84/6 | 73/6 |
| Rheostatic | 4/- | 7/- | | 12½ | 12½ | 7 2 9 | 8/- | 6/- |
| Richardsons Westgarth | 10/- | 15/9 | | 16½ | 8½* | 5 5 9 | 15/9 | 13/- |
| Scottish Cables | 4/- | 11/9 | +6d | 27½ | 27½ | 5 8 9* | 11/9 | 7/- |
| Simon-Carves | 5/- | 28/- | +6d | 20 | 25 | 4 9 3 | 28/9 | 22/6 |
| Smith (England), S. | 4/- | 10/- | | 17½ | 20 | 4 0 0* | 10/- | 7/- |
| Southern Areas | £1 | 12/3 | −6d | 7½ | Nil | Nil | 13/9 | 9/3 |
| Strand Elec. | 5/- | 7/9 | | 15 | 15 | 9 13 6 | 7/9 | 4/9 |
| Sturtevant | 5/- | 15/9 | | 15† | 15† | 4 15 3† | 18/- | 14/9 |
| Sun Elec. | £1 | 57/6 | −2/6 | 25 | 25 | 8 13 9 | 60/- | 47/3 |
| Switchgear & Cowans | 5/- | 17/9 | +1/- | 25 | 22½ | 6 6 9 | 17/9 | 8/9 |
| Taylor Tunnicliff | 5/- | 15/9 | +6d | 15 | 17½ | 5 11 0 | 15/9 | 11/9 |
| T.C.C. | 10/- | 35/- | | 25 | 25 | 7 2 9 | 38/6 | 32/6 |
| T.C. & M. | £1 | 28/9 | | 8½ | 8½‡ | 5 18 3 | 29/- | 20/- |
| Telephone Mfg. | 5/- | 5/9 | +3d | 10 | 10 | 8 14 0 | 5/9 | 4/6 |
| Telephone Rentals | 5/- | 12/3 | | 12½ | 12½ | 5 2 0 | 13/6 | 9/9 |
| Thompson (John) | 5/- | 25/6 | +6d | 25 | 25 | 4 18 0 | 27/- | 23/- |
| Thorn Elec. "A" | 5/- | 22/- | +9d | 17½ | 17½ | 3 19 6 | 23/3 | 17/- |
| Thornycroft | £1 | 30/- | | 12½ | 12½ | 8 6 9 | 30/- | 21/- |
| Tube Investments | £1 | 69/3 | +8/- | 15 | 17½ | 5 1 0 | 69/3 | 48/3 |
| Vactric | 5/- | 26/- | | 25 | 25 | 4 16 3 | 26/6 | 14/3 |
| Veritys | 5/- | 5/3 | | 12½ | 2½ | 2 7 6 | 6/9 | 5/3 |
| Walsall Conduits | 4/- | 16/9 | +6d | 20 | 22½ | 5 7 6 | 16/9 | 11/- |
| Ward & Goldstone | 5/- | 30/6 | +6d | 40 | 25* | 4 2 0 | 30/6 | 23/6 |
| Watford | 2/- | 7/3 | +3d | 25 | 25 | 5 10 3* | 7/6 | 5/- |
| Westinghouse | £1 | 41/3 | +1/3 | 18 | 10* | 4 17 0 | 41/3 | 32/3 |
| West, Allen | 5/- | 13/6 | +3d | 15 | 12½* | 4 12 6 | 13/6 | 9/3 |
| Wolf Electric | 5/- | 8/9 | +1/- | 20 | 10* | 5 14 3 | 9/- | 6/9 |

### Interim Report

Among companies which give their shareholders the advantage of an interim progress report, Sangamo Weston have stated lately that trading profits in the first half of this year totalled £206,000, or about £5,000 more than in the corresponding half of 1957. (The figures are subject to audit, and to changes in stock and work in progress at the end of June.) It is the company's practice to declare a single annual dividend in March. The rate has been 12½ per cent on the last three occasions, and on that basis the yield on the 10s shares at 19s 3d is 6½ per cent. Profits of 1957 covered the ordinary distribution three times over, and the balance sheet showed reserves well in excess of the £709,000 capital.

### T.I. Results

Excellent results from Tube Investments in respect of the year ended last July were far ahead of expectations, as may be judged from the subsequent improvement, from 61s 3d to 69s 3d, in the price of the company's £1 shares. With expansion of practically half a million to over £6 million in the net profit (after a much larger tax charge of £7 million) the company is raising the ordinary dividend from a total of 15 to 17½ per cent without deviating from the strict conservatism which has always governed the dividend policy. From the preliminary figures, it appears that three-quarters of the net surplus is being ploughed back into the business. On the new rate of dividend, the yield has improved to a fraction over 5 per cent.

### Sydney S. Bird

In declaring the maintenance of the interim dividend for the current year at 10 per cent, Sydney S. Bird advise shareholders that in the first eight months trading continued on the lines indicated earlier by the chairman in his review accompanying the 1957 accounts. While the latter showed an expansion of about 50 per cent in trading profits, shareholders were then warned to regard these results as exceptional, and to be prepared for the possibility of considerably lower earnings in 1958 as a result of increasingly severe competition. In their latest statement, the directors are reasonably confident, however, of being able to recommend a final dividend of 10 per cent, and so to repeat last year's total of 20 per cent, which was supplemented by a special tax-free payment out of capital reserves.

# REPORTS and DIVIDENDS

**Proposed A.E.I.-Henley Amalgamation.**—Details have been announced of an agreement between the boards of Associated Electrical Industries, Ltd., and W. T. Henley's Telegraph Works Co., Ltd., for the amalgamation of the cable and other manufacturing resources of the two companies. Henley's have received a conditional offer from A.E.I. to purchase the whole of the issued capital of Henley's on the following terms:—

The consideration for the purchase of the preference stock of the company shall be the issue by A.E.I. of one 4½ per cent "B" cumulative preference share of £1 in A.E.I. credited as fully paid (plus a payment in cash of 1s) in exchange for every £1 of preference stock of the company. The consideration for the purchase of the ordinary stock of the company shall be the issue by A.E.I. of 36 ordinary shares of £1 each in A.E.I. credited as fully paid in exchange for every complete £50 of ordinary stock of the company. The preference stock of the company will be sold cum all dividends accrued since 1st September last. The ordinary stock of the company will be sold ex the interim dividend of 2½ per cent already declared in respect of the year ending 31st December next. A capital distribution of 3d per 10s unit may be made to existing stockholders before the transfer to A.E.I. The A.E.I. preference shares to be allotted will rank for the full half-yearly dividend to 31st December next. The A.E.I. ordinary shares to be allotted will rank for all dividends to be declared after they are issued. The offer is conditional upon acceptance by the holders of not less than 90 per cent in nominal value of both the preference and the ordinary stock of the company (or such lesser percentage in either case as A.E.I. agree) on or before a date to be specified by A.E.I.; the granting by the Council of the Stock Exchange of permission to deal in and quotation for the necessary preference and ordinary shares in A.E.I.; and the granting by the Capital Issues Committee of its consent to the issue of the necessary preference and ordinary shares in A.E.I.

Speaking at a Press conference last week Lord Chandos, chairman of A.E.I., said that it was not a take-over bid, but was an industrial amalgamation designed to meet the needs of the cable industry. Excess capacity in the cable industry had been growing gradually and it was undesirable to have too many competing companies spending capital. The amalgamation was a move towards rationalisation which would be in four main forms. First, there would be a saving in capital expenditure; second, there would be a reduction in the present extreme variety of cables being produced; third, there would be a saving on research and development; and fourth, the group expected to get certain supply contracts which it would be advantageous to spread over a larger manufacturing base than either concern could provide independently. The identity of Henley's would be retained after the amalgamation and the board would remain in being. The work being done by the Siemens Edison Swan Group in some ways supplemented and complemented that done by Henley's.

A circular containing particulars of the offer and a recommendation that it should be accepted will be sent to Henley's stockholders as soon as possible.

**Morphy-Richards, Ltd.**—The group trading profits for the year ended 30th June last amount to £656,033, as compared with £603,974 for the preceding year, but after heavier charges for depreciation, interest and taxation, the net balance is a little lower at £218,433 (against £221,708), of which £217,996 (£215,571) is attributable to the company. General reserve receives £50,000 and it is proposed to pay a final dividend of 12 per cent, maintaining the distribution for the year at 20 per cent. The final dividend is payable on £713,732 (£669,685) capital. The balance carried forward is £319,577 (against £233,660 brought in).

**Tube Investments, Ltd.** — A preliminary statement shows group trading profits of £16,104,804 for the year ended 31st July last, as compared with £15,650,685 for the preceding year, and after meeting all charges, including £7,032,394 for taxation, the net balance is £6,003,438 (against £5,510,909). It is proposed to pay a final ordinary dividend of 10 per cent (against 7½ per cent), making 17½ per cent (15 per cent) for the year, leaving a balance of £4,356,071 (£4,089,619) for reserves and carry-forward.

**J. & F. Stone Lighting & Radio, Ltd.**—The consolidated trading profits for the year ended 30th June last amount to £860,678, as compared with £1,237,780 for 1956-57, and after meeting all charges, including £410,800 for taxation, the net balance is £309,188 (against £447,601). Reserve receives £50,000 and it is proposed to pay a final dividend of 20 per cent, again making 30 per cent for the year. The balance carried forward is £136,701 (against £84,513 brought in).

**Relay Exchanges, Ltd.,** is offering 582,331 ordinary shares of 5s each at 13s per share to existing shareholders in the ratio of one new share to every five held. Consent of the Capital Issues Committee has been obtained to the issue. The offer will remain open until 13th October and arrangements will be made to sell on behalf of the holders any new shares not taken up. An extraordinary general meeting will be held on 6th November to consider resolutions for increasing the authorised share capital to £2,250,000 and making a capitalisation issue in the ratio of one new share for every share held. This issue, if approved, will apply to the shares now being issued for cash as well as to the existing shares. The directors also announce that, following the capitalisation issue, an interim dividend of 7½ per cent will become payable on 19th November next on the ordinary share capital as increased by the rights issue and capitalisation issues.

**Franco Signs, Ltd.**—At the extraordinary general meeting held on 30th September the resolution to increase the capital of the company to £450,000 by the creation of 300,000 additional shares of 10s each was duly passed.

**The British Thermostat Co., Ltd.,** has declared an interim dividend of 7½ per cent (unchanged).

**The Marconi International Marine Communication Co., Ltd.,** is paying an interim dividend of 4 per cent (unchanged).

## New Companies

**W. Portsmouth & Co., Ltd.**—Registered 4th September. Capital £1,000. To acquire the business of W. Portsmouth & Co., of 36/38, John Street, Luton, and to carry on the business of electrical engineers and contractors, etc. Directors: W. V. Portsmouth and D. A. Biggs. Regd. office: 36/8, John Street, Luton.

**Stethophone, Ltd.**—Registered 9th September. Capital £100. Manufacturers and designers of acoustic-electronic apparatus, instruments, machines, accessories and devices for the reception, relay, transmission and distribution of radio broadcasts, etc. Directors: A. F. Pedersen, D. Hiscook and B. G. Kerr. Regd. office: Station Road, Gerrards Cross, Bucks.

## Liquidations

**John Richards & Co. (Electrical Engineers), Ltd.,** 8, Newhall Street, Birmingham, 3.—Winding up voluntarily. Liquidator, Mr. B. D. Scott, 8, Newhall Street, Birmingham, appointed 22nd September. Particulars of claims to the liquidator by 22nd October.

**Potts & Son (Electrical Contractors), Ltd.,** 14, Commercial Street, Longton, Stoke-on-Trent.—Winding up voluntarily. Liquidator, Mr. L. Goodwin, 6, Commerce Street, Longton, Stoke-on-Trent, appointed 22nd September.

**Thermionic Products, Ltd.,** manufacturers of electronic equipment, Pena Works, Hythe, Southampton.—Winding up voluntarily. Liquidator, Mr. W. T. W. Tickler, 19, Eastcheap, London, E.C.3, appointed 12th September. Particulars of claims to the liquidator by 16th October.

**G. Cousins, Ltd.,** radio and electrical dealers, 42, Tottenham Street, London, W.1.—Last day for receiving proofs for dividend 14th October. Liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

## Bankruptcies

**A. M. Henry,** 10, Woodgrange Avenue, Ealing Common, London, W.5, electrical heating engineer.—Last day for receiving proofs for dividend 10th October. Trustee, Mr. W. Whitehead, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver.

**G. Moore,** lately carrying on business under the style of the Electric Meter Co., at 123, Hele Road, Torquay, and 2, Barnhill Road, Torquay, electrical engineer.—Last day for receiving proofs for dividend 14th October. Trustee, Mr. J. E. Ellis, 50, The Terrace, Torquay.

# GENERATION and DEVELOPMENT

### *Benefits of Scottish Water Power*

Speaking at the recent opening of the North of Scotland Hydro-Electric Board's Moriston scheme (see *Electrical Review*, 3rd October, page 616), Sir Christopher Hinton, chairman of the Central Electricity Generating Board, said that by a proper integration it should be possible to secure a great many economies, and those economies would become more and more important in conjunction with nuclear power. He also spoke of the value of hydro-electric power in the development of the Highlands. "It seems to me that 20, 30 and 50 years hence people looking at the hydro-electric development of Scotland will not think of the temporary financial problems of the Board but will say how tremendously fortunate it was that this water power development took place when it did," he added.

Mr. Thomas Johnston, chairman of the North of Scotland Board, who presided at the opening ceremony, stated that, excluding developments in the cities of Aberdeen and Dundee and at Dounreay, they had records of 116 new industries, employing 3,000 persons, which had been established in the Board's area. Referring to other "considerable bonuses" which the Board were providing for the Highlands, Mr. Johnston said 104 miles of new roads, built at a cost of over £3 million, had already been handed over to Highland local authorities.

### *Tariff Reductions*

The reduction in the running charge of the bulk supply tariff from 0·47d to 0·46d announced last week is to be applied by the Southern Electricity Board as an additional incentive to load factor improvement. This is being done by reducing by 0·07d the price per kWh in each of the Board's standard off-peak tariffs, and the price per kWh under the second and third blocks of the standard and uniform maximum demand tariffs.

The North Eastern Electricity Board has decided to pass on the saving from the bulk supply tariff reduction to high load factor consumers and those taking restricted-hour off-peak supplies.

### *Belfast Chairman Replies to Criticisms*

Criticism of the Belfast electricity undertaking at the September meeting of the City Council was described by Alderman Lawther, chairman of the Electricity Committee, last week as "neither constructive nor fair." Alderman Cooper had implied that in general charges in Belfast were much higher than in Great Britain. That was not so. Taking the rateable value tariff, in Belfast the average valuation of domestic premises was £20 and the average annual consumption 1,000 kWh. The average Belfast consumer would pay £8 12s 7d net per annum, which was less than he would pay in the areas in Great Britain referred to by Alderman Cooper, or in any other area in Ireland for that matter.

Answering Alderman Cooper's question as to the employment and payment of consulting engineers, Alderman Lawther said that since the passing of an Act in 1954 their commission in respect of West power station was a matter for the chairman of the Northern Ireland Joint Electricity Committee. The total sums to be paid to them might be about £875,000.

Alderman Cooper, who described the reply as most unsatisfactory, has the option of discussing the matter further at the next meeting of the Electricity Committee.

### *Submarine Cables Across Lough*

Work has recently been carried out for the Northern Ireland Electricity Board on the laying of two 33 kV submarine cables across Larne Lough from Ballylumford power station, Islandmagee, to Curran Point power station in Larne Harbour. The underwater link obviates a land route of some 30 miles. Manufacture and laying of the two 1,800 yd lengths of cable was undertaken by Siemens Edison Swan, Ltd.

In normal practice cables are laid on the sea or river bed, but in this instance part of the cable route on both sides of Larne Lough is across a shipping channel. The cables have therefore been buried to a depth of 3ft for 150 yd at Curran Point and for 100 yd at Ballylumford. The necessary trenches were dredged by water pressure jets in conjunction with an airlift, the apparatus being designed and built specially for the work by a local marine engineer. Use was made of a diving team during operations. The consulting engineers responsible for the entire project are Messrs. Kennedy & Donkin.

### *Structure of South of Scotland Board*

An illustrated booklet published by the South of Scotland Electricity Board gives details of the Board's organisation and activities and briefly outlines its plans for future expansion. It is shown that the District covered by the Board extends to approximately 8,300 square miles with a population of nearly four million. Existing generating stations have an aggregate capacity of 1,489 MW (steam 1,366 and hydro 123 MW). The programme for the next seven years provides for a further 1,180 MW of installed capacity (output capacity 1,570 MW), including the Hunterston nuclear station in Ayrshire. Other sections of the brochure give information on the transmission and distribution systems, the Board's finances, and the membership of the Consultative Council for the South of Scotland District.

### *Glasgow Railway Electrification*

A further stage in British Railways' plans for the electrification of 71 miles of track in the Clyde Valley was reached on 15th September when work began on erecting the first overhead equipment on a stretch of line between Kilpatrick and Dalmuir Park stations on the Glasgow-Helensburgh route. Preparatory work has been taking place during the last six months on the erection of the overhead equipment. The first electric train is expected to run on the route some time in 1960 and full services will be in operation in 1961.

*33 kV cables being laid across Larne Lough, Northern Ireland*

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2*

**1943**

18070. Vaughan, F. H. M., Gollop, H., Crennell, J. T., and Hill, F. L.—Electrode elements. 1st November, 1944. (802650.)

**1950**

2434. Electric & Musical Industries, Ltd. —Apparatus for sensing the position of a movable element. 19th January, 1951. (802799.)

**1954**

1154. British Aluminium Co., Ltd.— Electrolytic cells for the production of aluminium. 14th January, 1955. (802471.)

2451. Electric & Musical Industries, Ltd. —Interpolating devices, especially for the control of automatic machine tools. 13th January, 1955. (802472.)

**1955**

1786. Minneapolis-Honeywell Regulator Co.—Semi-conductor devices. 20th January, 1955. (802429.)

6621. International Business Machines Corporation and Research Corporation.— Electronic digital computer. 7th March, 1955. (802656.)

9144. Link Aviation, Inc.—Voltage regulation. 29th March, 1955. (802735.)

9597. Siemens-Schuckertwerke Akt.-Ges. —Electric semi-conductor devices. 1st April, 1955. (Addition to 797505.) (802687.)

10762. Brown, Boveri & Cie Akt.-Ges. —Betatrons. 14th April, 1955. (802505.)

15255. British Thomson-Houston Co., Ltd.—Dynamic braking systems. 28th May, 1956. (802737.)

15358. Rank Cintel, Ltd.—Demountable pressurised high voltage connections. 25th May, 1956. (802671.)

16886 and 27305. British United Shoe Machinery Co., Ltd.—Machines adapted for use in assembling electrical components upon workpieces. 13th June and 26th September, 1955. (802658/9.)

17191. Westinghouse Brake & Signal Co., Ltd., and French, E. L.—Selenium rectifier. 4th May, 1956. (802432.)

21884. Siemens-Schuckertwerke Akt.-Ges. —Electric cables. 28th July, 1955. (Addition to 743325.) (802484.)

26694. Marconi's Wireless Telegraph Co., Ltd.—Electric pulse demodulators. 18th June, 1956. (802742.)

32896. Standard Telephones & Cables, Ltd.—Electrical calculating equipment. 17th November, 1955. (802692.)

33178. Minister of Supply.—Electric selector switches. 19th November, 1956. (802437.)

36337. Hobson, Ltd., H. M., and Fellows, H.—Pulse frequency measuring apparatus. 22nd October, 1956. (802693.)

36986. Staatsbedrijf der Posterijen, Telegrafie en Telefonie, and Standard Telephones & Cables, Ltd.—Electrical digital computers. 23rd December, 1955. (802745.)

37271. British Thomson-Houston Co., Ltd.—Earth fault protection for electrical equipment. 10th December, 1956. (802746.)

**1956**

2115. Zeiss-Stiftung, C. (trading as Zeiss, C.).—Photo-electric polarimeter. 23rd January, 1956. (802584.)

4216. Westinghouse Electric International Co.—Dynamo-electric machines. 10th February, 1956. (802749.)

5889. Standard Telephones & Cables, Ltd.—Railway route-setting equipment. 24th February, 1956. (802443.)

8066. Egen Electric, Ltd., and Bowman, A.—Variable resistors or potentiometers for use in radio receivers and the like. 15th March, 1957. (802445.)

9245. O'Shei, W. E.—Electric accumulators. 25th March, 1957. (802641.)

9576. Kips, E. J. E., and Derkson, J. W.— Traffic light switching arrangements. 27th March, 1956. (802590.)

10823. Siemens-Schuckertwerke Akt.-Ges. —Electric power installations for electric motors. 9th April, 1956. (802643.)

11031. General Electric Co.—Aircraft control systems. 11th April, 1956. (802536)

18097. Bristol Co. — Electromagnetic switching devices. 12th June, 1956. (802758)

18337. Telefonaktiebolaget L. M. Ericsson. —Apparatus for controlling and adjusting the capacitance of electrically insulated conductors. 13th June, 1956. (802597.)

19139. Bailey Meters & Controls, Ltd.— Photo-electric relays. 19th June, 1957. (802598.)

19406. Western Electric Co., Inc.— Switches. 22nd June, 1956. (802759.)

19763. General Electric Co.—Solid state electric cell. 26th June, 1956. (802760.)

20397. Westinghouse Electric International Co.—Electric motor control systems. 2nd July, 1956. (802708.)

21720. Western Electric Co., Inc.— Methods of encapsulating articles particularly electrical components. 13th July, 1956. (802599.)

22087. Philips Electrical Industries, Ltd. —Telephone circuit arrangements. 17th July, 1956. (802519.)

23304. Standard Telephones & Cables, Ltd. (Nippon Electric Co., Ltd.).—Bonding of metal to an insulating support. 27th July, 1956. (802455.)

23324. British Thermostat Co., Ltd.— Domestic washing machines. 12th July, 1957. (802520.)

27691. Libbey-Owens-Ford Glass Co.— Electrically conducting glass. 11th September, 1956. (802645.)

28162. General Electric Co.—Combustion chambers for fluid fuel. 14th September, 1956. (802545.)

32721. Compagnie Générale de Télégraphie sans Fil.—Adjustable inductance coils. 26th October, 1956. (802646.)

34143. Gar Wood Industries, Inc.— Electric cable terminations. 8th November, 1956. (802771.)

35668. Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine.—Electrolytic separation of isotopes. 21st November, 1956. (802555.)

35705. Standard Telephones & Cables, Ltd.—Static electrical test equipment. 22nd November, 1956. (802603.)

35957. General Electric Co.—Direct-driven lubricating pump assemblies for machines, particularly dynamo-electric machines. 23rd November, 1956. (802556.)

36871. Philips Electrical Industries, Ltd. —Television amplifying circuit arrangements. 3rd December, 1956. (802604.)

**1957**

618. Barmer Maschinenfabrik Akt.-Ges. —Switching arrangement for multi-motor drives. 7th January, 1957. (802607.)

2777. Standard Telephones & Cables, Ltd.—Equipment for sorting numbered articles. 25th January, 1957. (802608.)

3362. British United Shoe Machinery Co., Ltd.—Means adapted for use in trimming and forming leads of electrical components. 13th June, 1955. (Divided out of 802658.) (802661.)

5600. Standard Telephones & Cables, Ltd. (Nippon Electric Co., Ltd.)—Method of manufacture of manganese zinc ferrites. 19th February, 1957. (802613.)

13223. Philips Electrical Industries, Ltd. —Integrating circuit arrangements. 25th April, 1957. (802617.)

28186. International Business Machines Corporation, and Research Corporation.— Electronic digital computer. 7th March, 1955. (Divided out of 802656.) (802657.)

**1958**

10898. AMP, Inc.—Hand tools for crimping electrical connectors. 23rd December, 1954. (Divided out of 802651.) (802653.)

## TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 17th October :—

PULSATRON. No. 773,934. Class 7. Machinery employing ultrasonic vibrations for use in cleaning articles by immersion in cleaning fluid.—Kerry's (Ultrasonics), Ltd., Tonbridge Road, Harold Hill, Romford, Essex.

TELEFIELD. No. 771,923. Class 9. Television apparatus and aerials. — Telefield Manufacturing Co., Ltd., 120, City Road, Bristol, 2.

SKY COUNTESS. No. 777,667. Class 9. Electric batteries, cells, accumulators; radio receivers, television apparatus, gramophones, radio-gramophones, record players; and cases for electric torches.—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.

AQUAPAC. No. 773,881. Class 11. Boilers (not parts of machines).—John Thompson, Ltd., Ettingshall Engineering Works, Wolverhampton.

MERCURY. No. 776,201. Class 11. Electric water heating, space heating and cooking apparatus; heat pumps; washing boilers incorporating heating apparatus (not being parts of machines); air conditioning apparatus, refrigerators, electrically heated apparatus for making coffee; rotating spits, being parts of cooking apparatus; and liquid boiling apparatus incorporating electrodes.—Simplex Electric Co., Ltd., Broadwell, Oldbury, near Birmingham.

## Street Lighting Notes

**Edinburgh** Works Committee has approved schemes, estimated to cost £32,870, for the conversion during 1958-59 of the street lighting in 55 streets in the city from gas to electricity.

**Houghton-le-Spring** U.D.C. has received sanction to borrow £2,070 for improved electric lighting in Dairy Lane.

**Ilford** Corporation is recommended to approve a scheme, estimated to cost £20,000, for the provision of sodium street lighting in various district roads to the west of Ilford Lane and south of the High Road.

**St. Albans** City Council is applying for sanction to borrow £3,145 for street lighting in Watford Road and in Park Street.

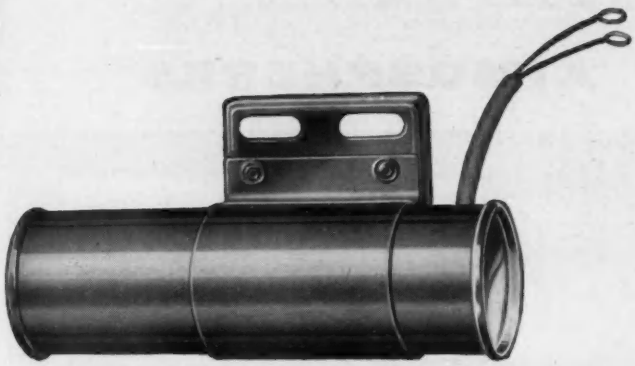
**Broadstairs and St. Peter's** U.D.C. has given approval to the first part of a scheme to convert all street lighting in the district from gas to electricity. The cost is estimated at £7,600.

The borough engineer of **Ramsgate** is to prepare plans for the conversion of the remaining gas street lighting to electricity. Nearly 1,000 lamps are to be replaced.

**Exmouth** U.D.C. plans to install new street lighting in many parts of the town at a cost of between £14,000 and £15,000.

**Blyth** Town Council is seeking permission to borrow £5,866 for sodium lighting in several streets.

# NON-STOP STARTING



Type TM3.

With this Dubilier Motor Starting Capacitor you can be sure of reliable starting every time. The capacitor element is hermetically sealed in an aluminium inner can mounted in a seamed metal outer casing with a strong mounting bracket designed to withstand a good deal of rough treatment.

Available in three ranges of r.m.s. voltages—150V: from 160 to 280μF; 275V: from 65 to 130μF; 350V: from 50 to 100μF.

Reliable operation at temperatures up to 60°C.

**Motor Start Capacitors by DUBILIER**

DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA RD., NORTH ACTON, LONDON, W.3. Phone: ACOrn 2241. Grams; Hilvoltcon Wesphone London.
DN 209

# Wavey WASHERS

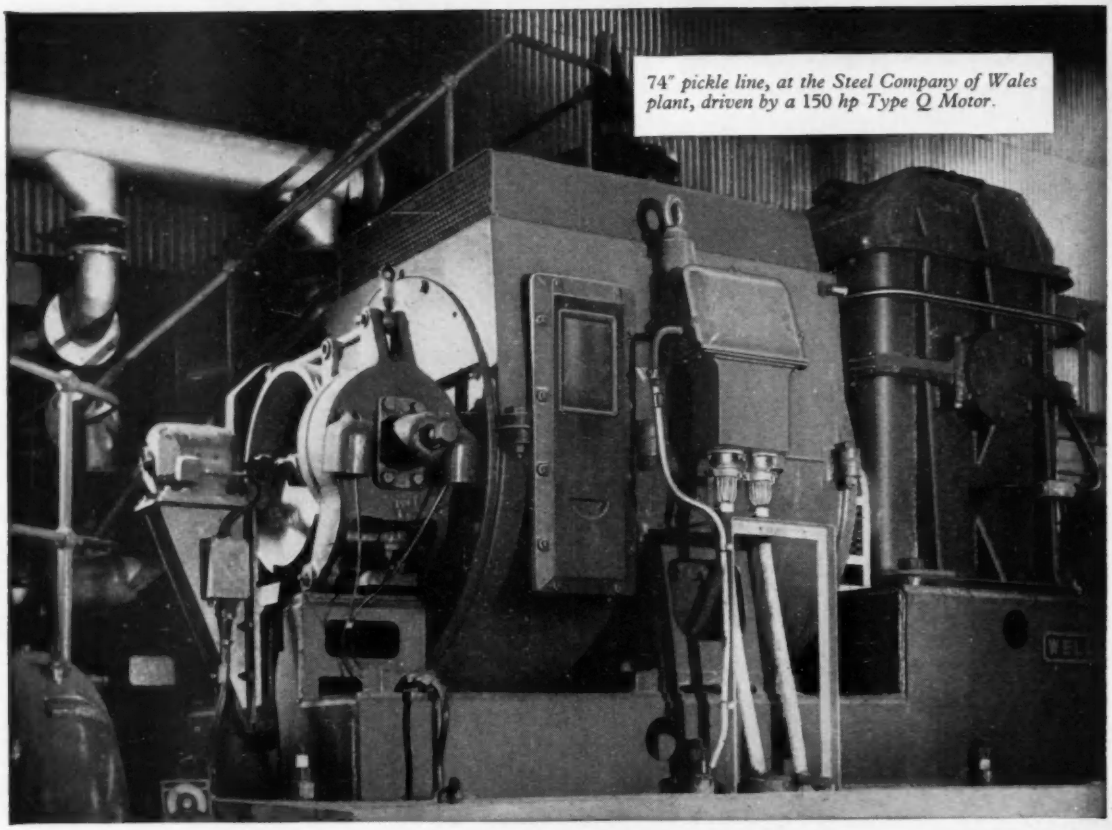
Beryllium Copper "Wavey" Washers. For Electronic Components. Range 10BA to ½" B.S.F. Corrosion resisting, non-damaging to components, higher resistance of "set", higher recovery of load, permanent spring action. They are fabricated from Beryllium copper, heat treated to VPN.350 minimum, Electro Plated to DTD.924, Cadmium Plated to DTD.904 and Passivated to DTD.923. Samples and price lists on request.

LEAVE IT TO Lewis OF REDDITCH
SPRINGS, SPRING CLIPS
PRESSWORK, WIRE FORMS
VOLUTE SPRINGS

THE LEWIS SPRING CO. LTD. Resilient Works, Redditch
Tel.: Redditch 720 PBX
London Office: 122 High Holborn, W.C.1 Tel.: Holborn 7470 & 7479

# Metrovick Type Q Motors

## FOR DUSTY ATMOSPHERES



*74" pickle line, at the Steel Company of Wales plant, driven by a 150 hp Type Q Motor.*

Specially designed for operation in dusty or corrosive conditions, the Metrovick Type Q totally-enclosed closed-air-circuit d.c. motor incorporates many improvements which help to simplify maintenance.

- ONE RADIATOR ONLY ON TOP OF THE MACHINE
- RADIATOR EASILY REMOVED AS A COMPLETE UNIT
- ENDBRACKETS CAN BE REMOVED, AND THE ARMATURE WITHDRAWN WITHOUT DISTURBING THE RADIATOR
- CARTRIDGE TYPE BEARING HOUSINGS
- SPLIT BEARING CAP AT THE DRIVING END
- GREASE LUBRICATORS EASILY ACCESSIBLE

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

*an A.E.I. Company.*

## Metrovick Motors for Trouble-Free Service

J/A 706

# NEXT WEEK'S EVENTS

*Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.*

## Monday, 13th October

BIRMINGHAM. — College of Technology, 6 p.m. I.E.E. South Midland Supply and Utilisation Group. "D.C. Winder Drives using Mercury-Arc Rectifier/Invertors," by L. Abram, J. P. McBreen and J. Sherlock.

BOURNEMOUTH. — Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth Branch. "Trivector Metering," by J. Collins.

BRISTOL. — Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Centre. Chairman's address, by R. W. Steel.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "The Rationalisation of the Avenues of Higher Education for Electrical Engineers," opened by the President.

A.S.E.E. Central London Branch. 7.15 p.m. Visit to E.A.W., 25, Foubert's Place, S.W.1.

MALVERN.—Winter Gardens, 7.30 p.m. I.E.E. South Midland Centre. "Radio Observations on Artificial Satellites," by J. A. Ratcliffe.

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. Chairman's address, by A. T. Crawford.

READING. — George Hotel, King Street, 7.15 p.m. I.E.E. district meeting. "Fundamentals of Fuel Efficiency in the Generation of Electricity," by R. Wood.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.S. Sheffield Centre. Chairman's address, by K. Marshall.

Livesey Clegg House, 44, Union Street, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. General meeting and chairman's address, "A.c. Motor Winding," by R. A. Reeve.

WALSALL.—A.S.E.E. Reading and Districts Branch. Visit to J. A. Crabtree & Co., Ltd.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North West London Branch. "Earthing," by S. J. Emerson.

## Tuesday, 14th October

ABERDEEN.—Robert Gordon's College, 7.15 p.m. Ministry of Works. "Space Heating by Electricity," by W. M. Stevenson.

BELFAST.—Civil Engineering Dept., Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. Chairman's address, "The Insulator Surface," by Dr. D. S. McIlhagger.

BIRMINGHAM.—Birmingham Exchange and Engineering Centre, Stephenson Place, 6.30 p.m. Institution of Heating and Ventilating Engineers, Birmingham and District. "Air Conditioning in Hospitals and some Related Aspects of Lighting," by J. P. Sandison.

CARDIFF.—Angel Hotel, 7.30 p.m. A.S.E.E. South Wales Branch. "Silicones in the Electrical Industry," by J. Davies.

GLASGOW. — A.S.E.E. Glasgow Branch. Visit to L. Sterne & Co., Ltd., Hillington.

LONDON. — Savoy Place, 5.30 p.m. I.E.E. Measurement and Control Section. Chairman's address, "The Scope of the Measurement and Control Section," by J. K. Webb.

At the Royal Institution, Albemarle Street, W.1, 6 p.m. Illuminating Engineering Society. Presidential address, "Light and Life," by C. C. Smith.

Connaught Rooms, 12.30 for 1 p.m. Electrical Industries Club. Luncheon. Speaker, Sir Harold Bishop.

Great George Street, Westminster, S.W.1, 5.30 p.m. Institution of Civil Engineers. "The Garry and Moriston Hydro-Electric Schemes," by C. M. Roberts, E. B. Wilson, J. H. Thornton and H. Headland.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilisation Group. "Electrification of the U.K.A.E.A. Industrial Group Factories," by J. W. Binns and W. J. Outram.

Central Library, St. Peter's Square, 6.30 p.m. Society of Instrument Technology, Manchester Section. "Accuracy in the Production of Modern Instruments," by H. Mathews.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. "Industrial Electronics," by Commander V. J. Copley-May.

PORTSMOUTH. — Ministry of Labour and National Service, Lake Road, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. "Radio Frequency Heating," by P. B. Curtis.

TONBRIDGE.—Rose and Crown Hotel, 7.30 p.m. A.S.E.E. West Kent Branch. "The Area Board's Views on the Testing of Installations," by G. H. Ingamells.

YORK.—"Georgian House," Blossom Street, 7.30 p.m. A.S.E.E. York Branch. "Electrical Control of Oil-burning Equipment."

## Tuesday, 14th October, to Saturday, 25th October

MANCHESTER.—City Hall. Building Trades Exhibition.

## Wednesday, 15th October

BRADFORD. — A.S.E.E. Bradford Branch. Visit to Bradford Telephone Exchange.

BRISTOL.—The University, 7 p.m. I.E.E. Bristol Graduate and Student Section. Chairman's address, by D. J. Matthews.

CARDIFF. — Cardiff College of Advanced Technology, 6.30 p.m. British Institution of Radio Engineers, South Wales Section. "Principles of Transistor Circuitry," by B. R. A. Bettridge.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South West Scotland Sub-Centre. Centre chairman's address, by R. J. Rennie.

LIVERPOOL. — University Club, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "The Manufacture of High Frequency Surface Barrier Transistors," by P. A. Charman.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate and Student Section. Chairman's address, "Electrical Power Generation and its Future in Southern England," by J. F. Outram.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. "Light and its Effect on the Development of Mankind," by R. L. C. Tate.

NEWCASTLE-UPON-TYNE. — King's College, Stephenson Buildings, 7 p.m. Society of Instrument Technology, Newcastle Section. "The Progress of Temperature Measurement in Industry," by R. Postle.

PORTSMOUTH. — College of Technology, Anglesea Road, 6.30 p.m. I.E.E. Southern Centre. "Re-heat Practice in Power Stations," by F. H. S. Brown and G. W. H. Dore. (Joint meeting with the Southern Branch of the I.Mech.E.).

PRESTON.—Demonstration Theatre, North Western Electricity Board, 19, Friargate, 7 p.m. I.E.S. North Lancashire Group. Presidential address, by C. C. Smith.

ROCHESTER.—King's Head Hotel, High Street, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Ultrasonics in Industry," by C. B. Abel-Harry.

RUGBY.—Rugby College of Engineering Technology, 6.30 p.m. I.E.E. Rugby Graduate and Student Section. "Junction Transistors and Their Applications," by J. Chandler.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. Chairman's address, "The Origin and Growth of Electronics," by Dr. F. A. Benson.

WOLVERHAMPTON.—Chamber of Commerce, Lichfield Street, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "Applications of Electricity to Mining," by G. W. Hall.

## Thursday, 16th October

DUBLIN.—Physical Laboratory, Trinity College, 6 p.m. I.E.E. Irish Branch. Chairman's address, by R. L. S. McDowell.

DUNDEE.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. Centre chairman's address, by R. J. Rennie.

HULL.—Y.E.B. Offices, Ferensway, 6.30 p.m. I.E.E. North Midland Centre "A Test Bed for D.C. Machines and Control Gear," by J. Hodgate and E. Rawnsley. (Joint meeting with Graduate and Student Section.)

IPSWICH.—Ipswich and District Electrical Association. Visit to Cobbold & Co., Ltd.

LEICESTER.—College of Technology and Commerce, The Newarke, 7 p.m. Society of Instrument Technology, East Midland Section. "Semi-Conductors and Their Applications," by G. M. Ettinger.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Utilisation Section. Chairman's address, "Installation Engineering," by R. A. Marryat.

At the Memorial Building, Institute of Marine Engineers, 76, Mark Lane, E.C.3, 2 p.m. Diesel Engineers' and Users' Association. Annual general meeting followed by "Automatic Control of Engine Driven Plants," by E. R. Hill.

NOTTINGHAM.—Electricity Service Centre, 6 p.m. I.E.S. Nottingham Centre. "Underwater Television," by D. Allanson.

PLYMOUTH.—S.W.E.B. Showrooms, New George Street, 3 p.m. I.E.E. South Western Sub-Centre. Chairman's address, by Capt. (L) W. W. Ash, R.N.

SOUTHAMPTON.—Polygon Hotel, 7.15 p.m. Institution of Production Engineers, Southern Region. Open Forum, "Electronics for Engineering."

## Friday, 17th October

ABERDEEN. — Robert Gordon's Technical College, 7.30 p.m. I.E.E. North Scotland Sub-Centre. Centre chairman's address, by R. J. Rennie.

BIRMINGHAM.—Grand Hotel, 6.30 p.m. for 7 p.m. Birmingham Electric Club. Annual dinner.

LIVERPOOL. — Strand Hotel, Brunswick Street. Incorporated Plant Engineers, Merseyside and North Wales Branch. Annual dinner.

LONDON. — Caxton Hall, Westminster, S.W.1, 6.30 p.m. E.P.E.A. Meter Engineers' Technical Group. "Meter Engineering Today," by H. S. Petch.

Café Royal, W.6, for 6.30 p.m. A.S.E.E. Golfing Society. Ladies' night.

Pepys House, 14, Rochester Row, S.W.1, 7 p.m. Junior Institution of Engineers. "Radio Measurements on the Russian Earth Satellites," by J. Heywood.

1, Birdcage Walk, S.W.1, 6 p.m. Institution of Mechanical Engineers. Presidential address, by Air Marshal Sir R. Owen Jones.

Savoy Hotel, W.C.2, 6.30 p.m. Association of Electrical Machinery Trades. Annual ball.

MANCHESTER.—Queen's Hotel. Electrical Trades' Commercial Travellers' Association, North Western Branch. Annual luncheon.

NOTTINGHAM.—Trent Bridge Hotel, 7.30 p.m. A.S.E.E. Nottingham Branch. Annual dinner.

SHEFFIELD. — Maynard Arms Hotel, Grindleford, 7.30 p.m. A.S.E.E. Sheffield Branch. Annual dinner and dance.

## Saturday, 18th October

LIVERPOOL.—A.S.E.E. Liverpool and District Branch, 7.30 p.m. Annual dinner.

LONDON.—I.E.E. London Graduate and Student Section. Visit to Metropolitan Water Board, Ashford Common (2.30 p.m.).

MANCHESTER. — A.S.E.E. Manchester Branch. Visit to C.E.G.B. Grid Control Centre, N.W.M. and N.W. Region.

OXFORD.—St. John's Hall, Marston Street, 7 p.m. A.S.E.E. Oxford and Districts Branch. "The Organisation of the A.S.E.E.", by E. A. Bromfield.

## Sunday, 19th October

LONDON.—A.S.E.E. Central London Branch. Visit to B.O.A.C. works and operational H.Q., London Airport.

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses*

**Antrim.**—County Education Committee. 29th October. Electrical installation in Brownlee Primary School, Lisburn. W. J. Ogle, consulting engineer, 63, Main Street, Bangor, Co. Down.

**Ashton-in-Makerfield.** — U.D.C. 25th October. Concrete columns and equipment for 25 group "B" mercury vapour discharge lighting units for housing development off Soughers Lane. Surveyor, Town Hall.

**Australia.**—Electricity Commission of New South Wales, Sydney. 25th November. 132 kV outdoor circuit-breakers and transformers. (E.S.B. 24011/58. Ten/34869.)*

**Bodmin.**—Corporation. 22nd October. Street lighting equipment. (See this issue.)

**Burma.**—Burma Purchase Board, Rangoon. 13th October. Battery chargers. (E.S.B. 24052/58. Ten/34907.)* Battery plates. (E.S.B. 24053/58. Ten/34913.)*

**Formosa.**—Central Trust of China, Taipei. 31st October. Transformers, oil and air circuit-breakers, and safety switches. (E.S.B. 23996/58/I.C.A. Ten/34895.)*

**Greece.** — State Procurements Service, Athens. 15th October. Rubber cable. (E.S.B. 24185/58. Ten/34948.)* 16th October. Interphone sets. (E.S.B. 23650/58. Ten/34814.)*

**Ilford.**—Borough Council. 28th October. Immersion heaters, etc., for the modernisation of 74 pre-war houses on the Horns Road estate. Borough engineer, Town Hall.

**India.** — Neyveli Lignite Corporation (Private), Ltd. 13th November. Underground cables. (E.S.B. 23913/58. Ten/34854.)*

Bombay Electricity Supply and Transport Undertaking. 20th November. 6·6 kV static capacitors, relays and meters. (E.S.B. 23866/58. Ten/34860.)*

National Coal Development Corporation (Private), Ltd., Calcutta. 24th October. Steel reinforced aluminium conductor. (E.S.B. 24269/58. Ten/34952.)*

Director General of Supplies and Disposals, New Delhi. 6th November. Two electrically driven centrifugal pumping sets. (E.S.B. 24064/58. Ten/34927.)*

**Iran.**—Abadan Municipality. 14th October. Two 750 kVA transformers. (E.S.B. 24013/58. Ten/34924.)*

Iranian State Railways, Teheran. 16th October. Electrical materials. (E.S.B. 24035/58. Ten/34934.)*

Iran Sugar Refineries Administration, Teheran. 22nd December. Underground cables. (E.S.B. 23439/58. Ten/34766.)*

**Korea.**—Government Office of Supply, Seoul. 9th November. Telephone open wire carrier equipment. (E.S.B. 23453/58. Ten/34778.)*

**Lebanon.**—Ministry of Public Works and Communications, Development Department for Hydraulics and Electricity, Beirut. 21st October. Package substations. (E.S.B. 23397/58/I.C.A. Ten/34783.)*

**Leeds.**—City Waterworks Department. 31st October. Electrically driven automatic booster pumping plant, complete with switchgear, motors, time controls, etc., at Bramley Reservoir. K. L. Forster, general manager and engineer, Civic Hall.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

**New Windsor.**—Borough Council. 8th November. Electric lamps (schedule 15), and electric fittings and cable (schedule 21), for the year ending 31st December, 1959. Borough engineer, Kipling Building, Alma Road, Windsor.

**New Zealand.** — State Hydro-Electric Department, Wellington. 20th January. Power line carrier relaying and communication equipment. (E.S.B. 23528/58. Ten/34794.)*

G.P.O., Wellington. 5th November. Cable. (E.S.B. 23600/58. Ten/34793.)* 10th November. Resistors. (E.S.B. 23599/58. Ten/34795.)*

**Nigeria.** — Electricity Corporation of Nigeria. 28th October. General stores and distribution materials. (See this issue.)

**Portuguese East Africa.**—Ports, Railways and Transport Department, Lourenço Marques. 15th October. Electrical equipment for port and railway distribution network, Quelimane. (E.S.B. 23757/58. Ten/34884.)* 15th October. Motor generator set. (E.S.B. 24094/58. Ten/34904.)* Two 60 h.p. diesel engines, switchboard and accessories for Mabalane power station. (E.S.B. 23760/58. Ten/34891.)* 24th November. Testing equipment for underground cable and aerial lines. (E.S.B. 23765/58. Ten/34846.)*

**Rothwell (Yorks).**—U.D.C. 24th October. Sodium electric discharge street lighting units. (See this issue.)

**South Africa.**—City Treasurer's Department (Buying Branch), Johannesburg. 13th October. 100 kVA, 200 kVA, 300 kVA and 400 kVA transformers. (E.S.B. 23665/58. Ten/34805.)*

Cape Town Electricity Department. 31st October. Cables and accessories for Athlone power station. (E.S.B. 23284/58. Ten/34717.)*

Stores Department, South African Railways, Johannesburg. 15th October. Underground armoured cable. (E.S.B. 23748/58. Ten/34824.)* 17th October. Copper, galvanised steel and aluminium wire. (E.S.B. 23167/58. Ten/34718.)* 22nd October. Insulators. (E.S.B. 23746/58. Ten/34817.)* 24th October. Seven electric goods lifts. (E.S.B. 23747/58. Ten/34819.)*

Union Tender and Supplies Board, Pretoria. 23rd October. Radio valves. (E.S.B. 23935/58. Ten/34859.)*

Durban Corporation. 31st October. Six 1,000 kVA transformers. (E.S.B. 23948/58. Ten/34858.)*

Transvaal Provincial Tender Board, Pretoria. 17th October. One 60 kVA diesel generating set. (E.S.B. 24103/58. Ten/34906.)* L.v. switchboard for Krugersdorp hospital. (E.S.B. 24102/58. Ten/34916.)* Condensing and cooling units. (E.S.B. 24101/58. Ten/34990.)*

**Staffordshire.**—County Education Committee. 1st November. One 7·5 kW glass bulb mercury arc rectifier. (See this issue.)

**Sudan.**—Department of Posts and Telegraphs, Khartoum. 10th November. Inert and air polarised cells. (E.S.B. 23318/58. Ten/34726.)*

**Taunton.**—Borough Council. 18th October. Electrical goods for one year from 1st January, 1959. K. A. Horne, town clerk, Municipal Buildings.

**Thailand.**—Telephone Organisation, Bangkok. 17th October. Dial telephone instruments. (E.S.B. 23332/58. Ten/34742.)*

**Tottenham.**—Borough Council. 30th November. Electric lamps (Form No. 5), for the year commencing 1st April, 1959. M. Lindsay Taylor, town clerk, Town Hall, N.15.

**Worksop.**—Corporation. Lighting equipment for a garage. (See this issue.)

### WORK IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors*

**Berkhamsted.**—Factory and offices, Spital Meadow; Chrysaline, Ltd., 282, High Street.

**Birmingham.**—Dwellings (25), and eight shops, Holly Bank Road, King's Heath; A. G. Sheppard Fidler, city architect, Civic Centre, 1.

**Blackburn.**—Erection of St. Monica's R.C. School, Green Lane; Fairbrother and Partners, architects, Kiln Hill Close, Chadderton.

**Blyth.**—Houses (150-200), near North Farm housing estate; D. W. Foster, borough engineer.

**Brechin.**—Houses (32), Mountskip Road; J. A. Bent, Scottish Special Housing Association, Ltd., 15/21, Palmerston Place, Edinburgh, 12.

**Darlington.**—Additions for the Underground Mining Machinery Co., Ltd., Aycliffe; Fennell & Baddiley, architects, Bridge End Chambers, Chester-le-Street.

**Darwen.**—Junior school for St. Cuthbert's; Leach, Rhodes & Walker, architects, 90, Deansgate, Manchester.

**Dewsbury.**—Houses, Spen Valley Road (70), and Eastborough (47); borough engineer, Municipal Buildings, Halifax Road.

**Durham.**—R.C. church, Framwellgate Moor; Father Costelloe, St. Godrics Presbytery, Durham.

**Esher.**—Houses (55), Farm Road site, Contract No. 261; F. Edwards, clerk, Council Offices, Esher, Surrey.

**Grangemouth.**—Houses (350); burgh surveyor.

**Guildford.**—Three-storey shops and other buildings, Upper High Street; Brownrigg & Turner, architects, 163, High Street.

**Hartlepool.**—R.C. school, King Oswy Drive; T. A. Crawford, architect, 80, Borough Road, Middlesbrough.

**Heanor.**—Houses (30), Godkin estate, Langley Mill; R. Archer, surveyor, Council Offices, Heanor, Derbyshire.

**High Wycombe.** — Methodist church; Harrison & Stevens, architects, 9, Great James Street, London, W.C.1.

Science block for Royal Grammar School; H. Emery & Sons, Ltd., builders, Keep Hill Road.

**Hove.**—Flats (48), Hangleton Park estate; T. J. Braybon & Sons, Ltd., Princes House, North Street, Brighton.

**Ipswich.**—Flats (44), Chantry estate; borough engineer.

**Leyland.**—Town hall (£100,000); F. Howe, U.D.C. surveyor, Public Hall Buildings.

**Llandudno.**—Flats and bungalows (53), Trinity Avenue; J. Edwards, surveyor, Town Hall.

**Middlesbrough.**—Houses (30), Ruskin Drive; E. T. Sweeting & Son, builders, Back Haymore Street, Middlesbrough.

**Nailsea.**—Houses (450); W. K. Surtees, Ltd., Lyon House, Lyon Road, Hersham, Surrey.

**Newbiggin-by-the-Sea.** — Houses (370), Newbiggin Moor; surveyor, Council Chambers, Front Street, Newbiggin, Northumberland.

**Orpington.**—Houses (106), Farnborough Hill; Davis Estates, Ltd., 346, Kilburn High Road, N.W.6.

**Scunthorpe.**—Twelve shops and flats, Ashby High Street; A. Richmond & Sons, Ltd., builders, Main Road, Retford, Notts.

# Will the 5.15 go through?

It depends on the switchgear.

And the switchgear depends on P & G.

But railway electrification work is only one of the many activities depending on P & G batteries. There are many others involving switch closing, switch tripping, emergency lighting, standby power supply, supervisory control, etc.

PLEASE SEND FOR DESCRIPTIVE BOOKLET TO:

PRITCHETT & GOLD and E.P.S. CO. LTD., 137 VICTORIA STREET, LONDON, SW1

(BATTERY MAKERS SINCE 1882)

PG35

# GLENFIELD SLUICE VALVES *for* ELECTRICAL OPERATION

**As the electrical operation of Sluice Valves is frequently called for in power station service, we have perfected it.**

**Such valves, of the inside, outside rising and outside non-rising screw types, have high torque induction motors, those of 3 h.p. and above being provided with the Glenfield torque limiting starter arrangement. Control can be local and, or alternatively, remote with distant gate position indication. All have local gate indicators and auxiliary hand gear incorporating the Glenfield automatic safety interlock switch.**

Glenfield

GLENFIELD & KENNEDY, LIMITED, KILMARNOCK

*HEAD OFFICE & WORKS: KILMARNOCK, SCOTLAND*

VALVE SPECIALISTS AND HYDRAULIC ENGINEERS FOR OVER A CENTURY

# NEW ENGLISH ELECTRIC

Vee-Line

## Radiant Hotplates

*available in 6¼" and 8" diameters*

**New hinged coil means easier, more convenient cleaning.** Made specially to cope with spilled liquids. Coil swivels up for easier cleaning of new, deeper reflector plate.

**Maximum contact area ensures fast boiling.** Wide flat-topped coil provides a bigger contact area. Ensures quicker, lower-cost cooking.

**Exclusive flat coil design guarantees efficiency, long life.** Robust construction keeps it free from distortion due to expansion and contraction.

*The ENGLISH ELECTRIC Vee-line Radiant Hotplate is designed to conform fully to the EDA Interchangeability Specification for all makes of cookers.*

**Send now for full details of the most advanced Radiant Hotplate on the market.**

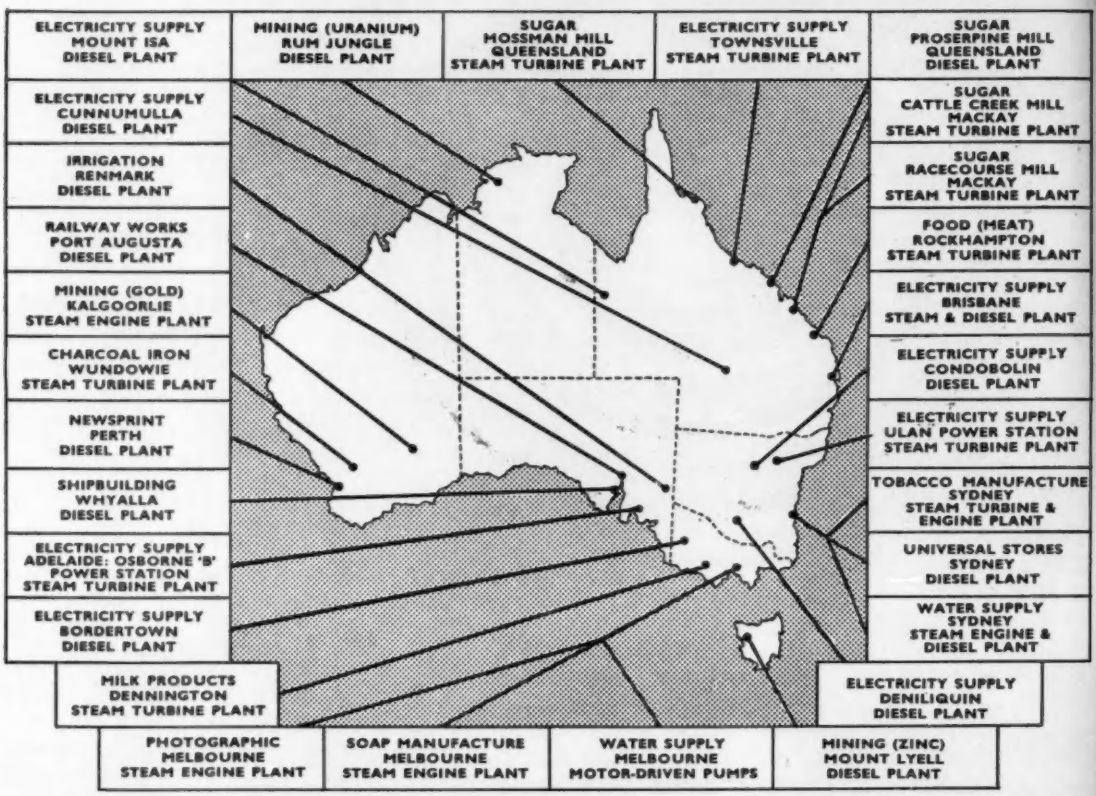
IN FUTURE FIT **Vee-Line**

THE ENGLISH ELECTRIC COMPANY LIMITED, DOMESTIC APPLIANCE DIVISION, EAST LANCASHIRE ROAD, LIVERPOOL, 10

G

# ALLEN POWER

## for AUSTRALIA'S INDUSTRIES and ESSENTIAL SERVICES


ELECTRICITY SUPPLY MOUNT ISA DIESEL PLANT
MINING (URANIUM) RUM JUNGLE DIESEL PLANT
SUGAR MOSSMAN MILL QUEENSLAND STEAM TURBINE PLANT
ELECTRICITY SUPPLY TOWNSVILLE STEAM TURBINE PLANT
SUGAR PROSERPINE MILL QUEENSLAND DIESEL PLANT
ELECTRICITY SUPPLY CUNNUMULLA DIESEL PLANT
SUGAR CATTLE CREEK MILL MACKAY STEAM TURBINE PLANT
IRRIGATION RENMARK DIESEL PLANT
SUGAR RACECOURSE MILL MACKAY STEAM TURBINE PLANT
RAILWAY WORKS PORT AUGUSTA DIESEL PLANT
FOOD (MEAT) ROCKHAMPTON STEAM TURBINE PLANT
MINING (GOLD) KALGOORLIE STEAM ENGINE PLANT
ELECTRICITY SUPPLY BRISBANE STEAM & DIESEL PLANT
CHARCOAL IRON WUNDOWIE STEAM TURBINE PLANT
ELECTRICITY SUPPLY CONDOBOLIN DIESEL PLANT
NEWSPRINT PERTH DIESEL PLANT
ELECTRICITY SUPPLY ULAN POWER STATION STEAM TURBINE PLANT
SHIPBUILDING WHYALLA DIESEL PLANT
TOBACCO MANUFACTURE SYDNEY STEAM TURBINE & ENGINE PLANT
ELECTRICITY SUPPLY ADELAIDE: OSBORNE 'B' POWER STATION STEAM TURBINE PLANT
UNIVERSAL STORES SYDNEY DIESEL PLANT
ELECTRICITY SUPPLY BORDERTOWN DIESEL PLANT
WATER SUPPLY SYDNEY STEAM ENGINE & DIESEL PLANT
MILK PRODUCTS DENNINGTON STEAM TURBINE PLANT
ELECTRICITY SUPPLY DENILIQUIN DIESEL PLANT
PHOTOGRAPHIC MELBOURNE STEAM ENGINE PLANT
SOAP MANUFACTURE MELBOURNE STEAM ENGINE PLANT
WATER SUPPLY MELBOURNE MOTOR-DRIVEN PUMPS
MINING (ZINC) MOUNT LYELL DIESEL PLANT

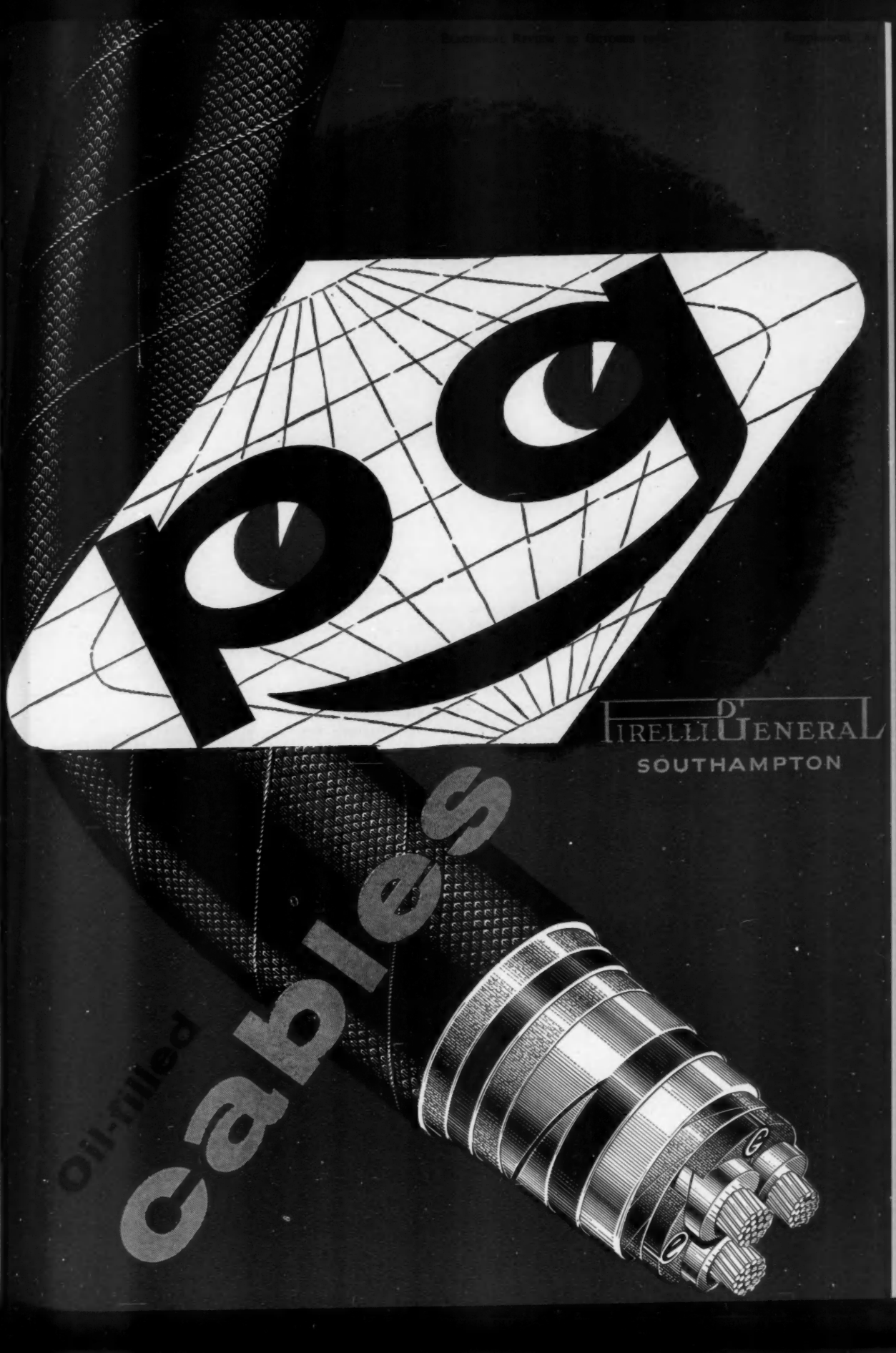
Indicated above are the locations of some of the many ALLEN machinery installations which are meeting the demand for power in a wide variety of industries and for public and other services throughout the Commonwealth of Australia. These are in addition to the large number of installations on board naval and mercantile vessels in Australian service.

---

***Specialists in complete Power Generating Plant and Pumping Plant installations***

ALLEN products include :- STEAM TURBINES : DIESEL ENGINES : STEAM ENGINES
GAS TURBINES : GEARING : CONDENSING PLANT : PUMPS : ALTERNATORS
D.C. GENERATORS : MOTORS (A.C. & D.C.) : CONTROL GEAR : SWITCHBOARDS

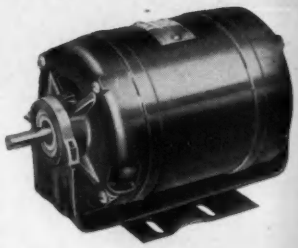
W. H. ALLEN SONS & Co. LTD
BEDFORD ■ ENGLAND

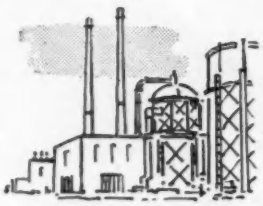

pg
PIRELLI GENERAL
SOUTHAMPTON
Oil-filled
cables

# CROYDON

## FOR WHEREVER A F.H.P. MOTOR IS NEEDED!

TAPE RECORDERS & BUSINESS MACHINES





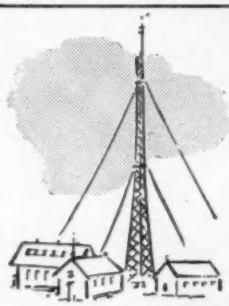
CHEMICAL PLANT

As Specialists in the design, development and manufacture of F.H.P. Electric Motors which are quality-built to give reliability in service, we offer a most comprehensive range of machines. The range is shown in our new fully illustrated Brochure, copies of which are available on request.

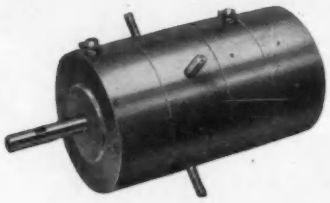
We produce F.H.P. Motors for–

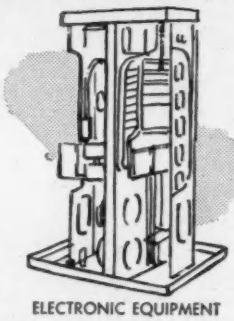
Air Conditioning Equipment, Business Machines, Chemical Plant, Control Devices, Electronic Equipment, High Frequency Blowers and Fans, Radar Aerial Drives, Servo Controls and many other applications. Also complete Alternator Sets, Generator Sets, Geared Units, Brake Motors, Governed Machines, Rotary Convertors, Torque Motors, etc.

RADAR AERIAL DRIVES



TELEVISION EQUIPMENT



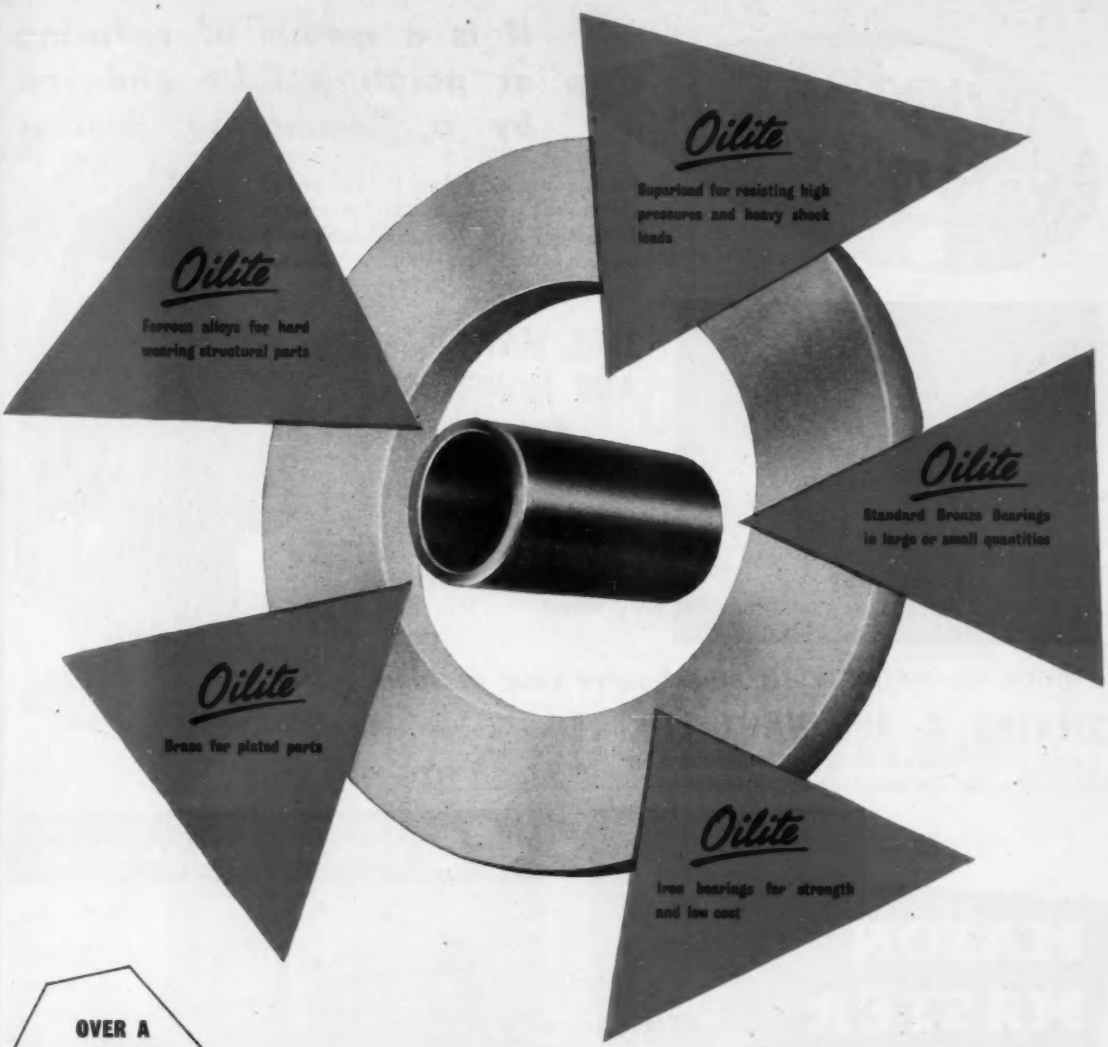


ELECTRONIC EQUIPMENT

**THE CROYDON ENGINEERING CO., LTD.**

COMMERCE WAY • PURLEY WAY • CROYDON • SURREY

*Telephone:* CROYDON 4125/6/7/8 *Telegrams:* SYNCROY, CROYDON


Oilite
Superlead for resisting high pressures and heavy shock loads
Oilite
Ferrous alloys for hard wearing structural parts
Oilite
Standard Bronze Bearings in large or small quantities
Oilite
Brass for plated parts
Oilite
Iron bearings for strength and low cost

**OVER A MILLION BEARINGS IN MORE THAN A THOUSAND DIFFERENT SIZES**

*self-lubricating bearings and powder metal parts*

**Oilite**

Precision finished machine parts and self-lubricating bearings are supplied in a variety of alloys produced by modern methods of powder metallurgy. Many bearings are available from stock and we will gladly undertake special production where quantities warrant the preparation of tooling. Cored and Solid bar, and plate stock can be supplied for small quantity production.

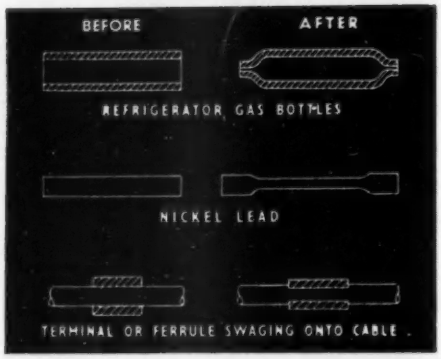
*Please write for further details and technical data.*

**THE MANGANESE BRONZE & BRASS CO LTD** *Elton Park Works Hadleigh Rd Ipswich · Grams: Oilite Ipswich · Tel: Ipswich 55926*

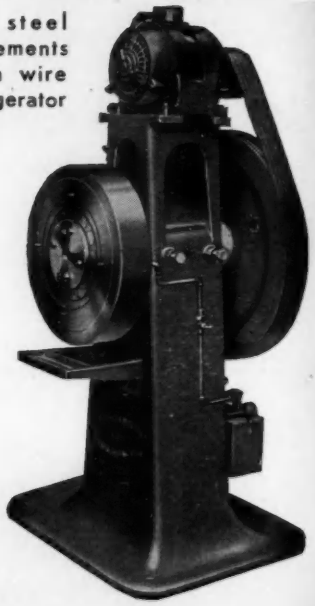
P.2210

## What is Rotary swaging?

***It is a means of reducing or pointing tube and rod by a hammering process***




Reducing powder filled steel inconnel and copper elements Tungsten and Molybdenum wire for filaments. Necking refrigerator gas bottles.



**TIME, MATERIAL AND MONEY IS SAVED**

- No wastage of material
- Operated by unskilled labour
- Cheapest and Quickest method

SEND FOR FULL PARTICULARS—***It might solve your problem***

**STEVENS & BULLIVANT LTD.**
Western Road · BIRMINGHAM 18

*Telephone: NORthern 4514/5 and 0236*
*Telegrams: "Swager, Birmingham"*

## MASON MASTER

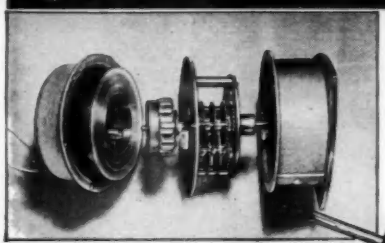
can be used in all electric power drills

With the Tungsten Carbide tip electronically brazed with copper, Mason Master plugging drills will stand up to Red Heat, allowing them to be used in any portable electric drill.

*With a FREE Resharpening Voucher*
*Send for leaflet E.R.*

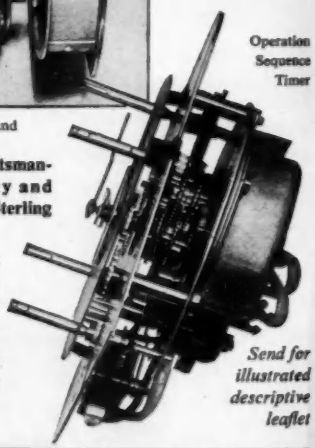
**JOHN M. PERKINS & SMITH LTD**
**BRAUNSTON - RUGBY**
*Telephone: BRAUNSTON 351-2*

## people are talking...



**about the *STERLING* qualities**

Operation Sequence Timer



Self Starting Synchronous Motor and Gearbox

**. . about the reliability, craftsmanship, precision, ingenuity and reasonable pricing of Sterling Instruments.**

Consult Sterling for process timing · cooker control · miniature reduced gear units · cyclic processing.

They design and assemble to customers' specific needs or build from customers' own drawings.

*Send for illustrated descriptive leaflet*

**STERLING INSTRUMENT**
COMPANY LIMITED
BODEN WORKS CHARD SOMERSET
*A member of the Sterling Industries Group*
Chard 2341/2

# for CONDUCTORS

**COPPER WIRE**
plain or tinned, cotton, paper or asbestos covered.

**ALUMINIUM WIRE AND STRIP**
plain, cotton, paper or asbestos covered.

**COPPER OR ALUMINIUM STRAND**
for overhead power transmission.

**COPPER OR ALUMINIUM BUSBARS**

**CADMIUM COPPER**

*Also* K *for* ALUMINIUM ALLOY

## CONDUIT TUBING, BARS, TUBES AND SECTIONS

*Durcilium (Regd.) Alumagnese*

**E. & E. KAYE LTD.**
PONDERS END · ENFIELD · MIDDLESEX

*Telephone.. Howard 1601*
*Telegrams.. Cuwire, Enfield*

KS

# IF YOUR MOTOR NEEDS A CAPACITOR

**• for starting • running • P.F. Improvement**

**• interference suppression or other applications**

## HUNTS CAN SUPPLY IT!

With every Hunt Capacitor comes the accumulated volume of knowledge and practical skill acquired over more than 20 years of specialisation. Each class of Capacitor is produced under separate laboratory control. Strict examinations of raw materials, careful inspection at intermediate stages of manufacture, and full individual tests on completion, ensure the reliability of the product.

*MANUFACTURERS OF CAPACITORS FOR RADIO AND TELEVISION EQUIPMENT, ELECTRONIC EQUIPMENT, POWER FACTOR IMPROVEMENT, CAPACITOR MOTORS, PHASE SPLITTING, H.F. AND R.F. HEATING, IGNITION AND INTERFERENCE SUPPRESSION, TELEPHONE INSTALLATIONS*

TYPE L26A DRY ELECTROLYTIC

TYPE L84 FOIL AND PAPER

TYPE L23 DRY ELECTROLYTIC

TYPE L21A DRY ELECTROLYTIC

TYPE L26 DRY ELECTROLYTIC

TYPE L22 DRY ELECTROLYTIC

TYPE L89/1 FOIL AND PAPER

TYPE L88 FOIL AND PAPER

TYPE W54/11 METALLISED PAPER

TYPE L54 FOIL AND PAPER

REGISTERED TRADE HUNTS MARK CAPACITORS

**A. H. HUNT (Capacitors) LTD.** Electrical Division, Vulcan Way, New Addington, Croydon, Surrey. Telephone: Lodge Hill 2661-4.

Head Office: Bendon Valley, Garratt Lane, Wandsworth, London S.W.18

*Factories also in Essex and North Wales*

# Wire for the Electrical Industry

ALUMINIUM
WIRE, STRIP
& STRAND

COPPER WIRE,
STRIP & STRAND

Spencers of WAKEFIELD

STEEL CORED
ALUMINIUM CONDUCTORS

★ *Our Technical advice is always available — why not make use of it?*

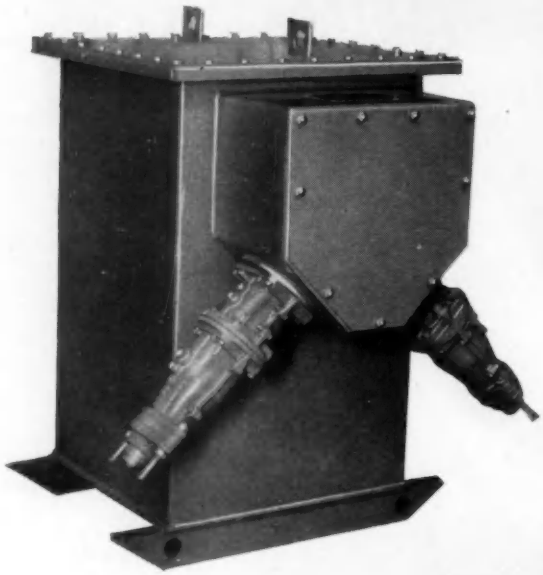
**THE SPENCER WIRE COMPANY LIMITED**

P.O. BOX 14 WAKEFIELD - YORKSHIRE

*Telephone Wakefield 6111 (10 lines)*
*Telegrams Spencer, Wakefield, Telex. Telex No. 55.160*

DaW 658ER

# BONAR, LONG & CO. LTD.
## DUNDEE



## CAPACITORS

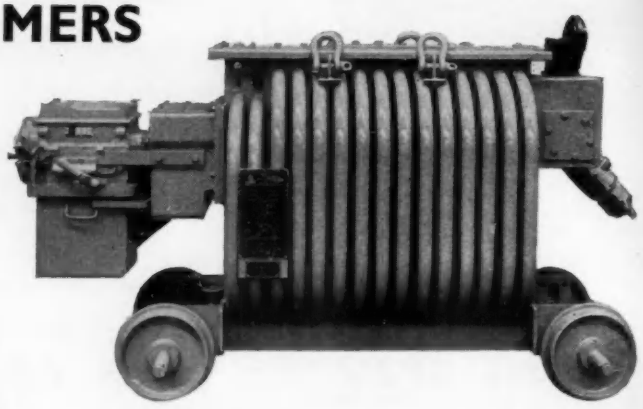
For Power Factor improvement.
Our Engineers can advise you
how Capacitors can save money.
The service is without obligation.

*Send for leaflet No. PT 18 TODAY*

## MINING TYPE TRANSFORMERS

To N.C.B. and
B.S. Specifications

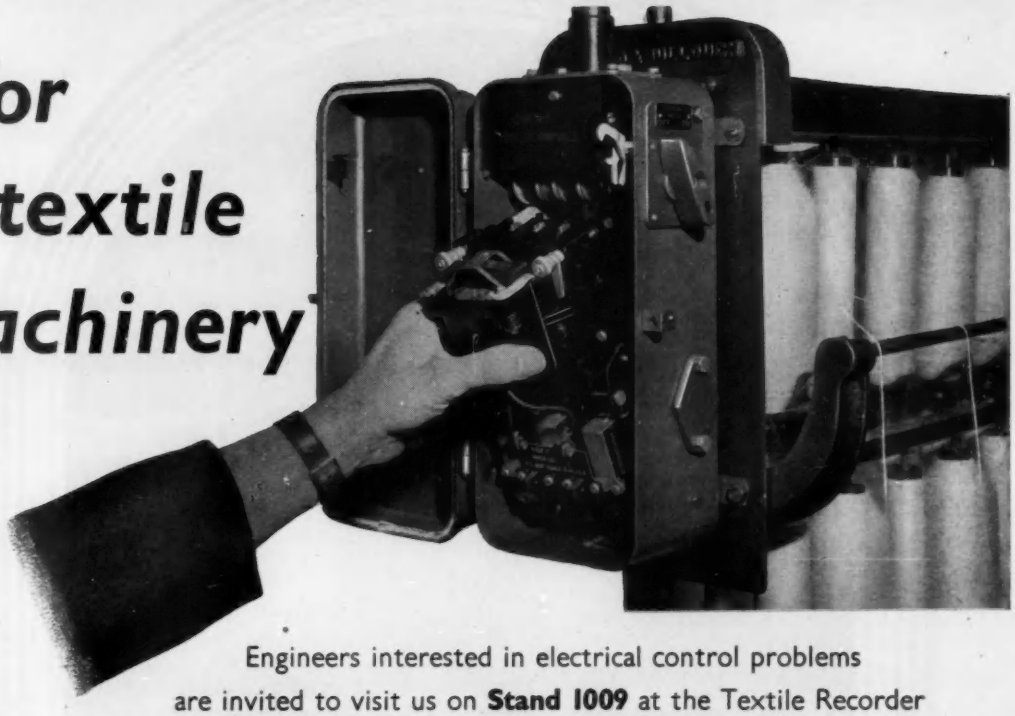
*May we have*
*your enquiries?*



*Telephones : LONDON—SLOANE 7244*
*MANCHESTER—SALE 6164*
*DUNDEE—84241/4*

# ELECTRIC MOTOR CONTROL GEAR

## *for textile machinery*



Engineers interested in electrical control problems are invited to visit us on **Stand 1009** at the Textile Recorder International Textile Machine and Accessories Exhibition, Belle Vue, Manchester, 15-25th October

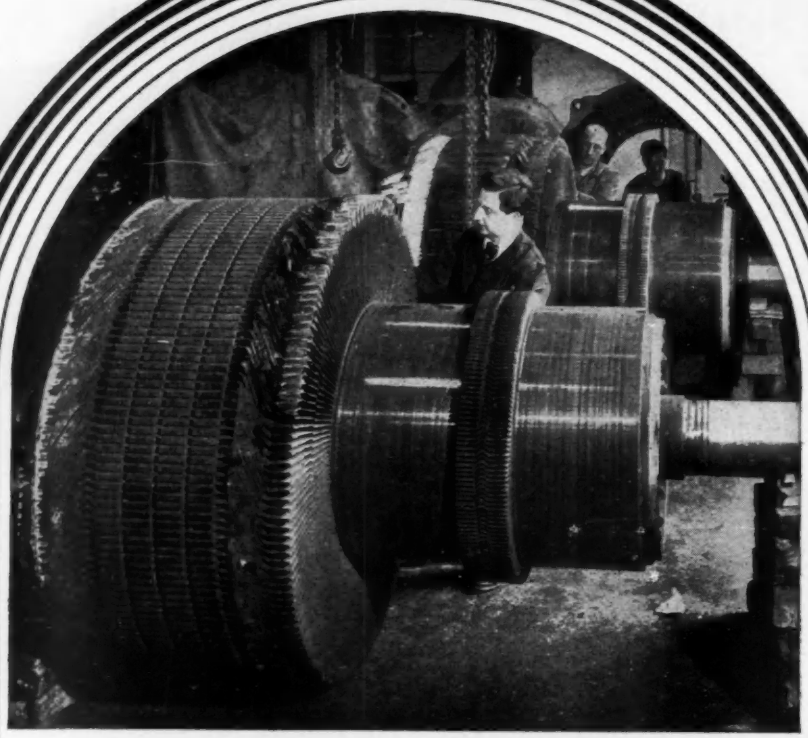
Allen West type "PSC4D" plug-in starters fitted to Spinning Frames at the mills of Messrs. Haslam Spinning Co. Ltd., Bolton, by whose courtesy these illustrations are reproduced.

- **Standard starters—flush and surface mounting**
- **Special assemblies for building-in**
- **Large floor-mounted control equipment**
- **Push-buttons, limit switches and other accessories**

*For every electric motor there is an Allen West starter*

ALLEN WEST

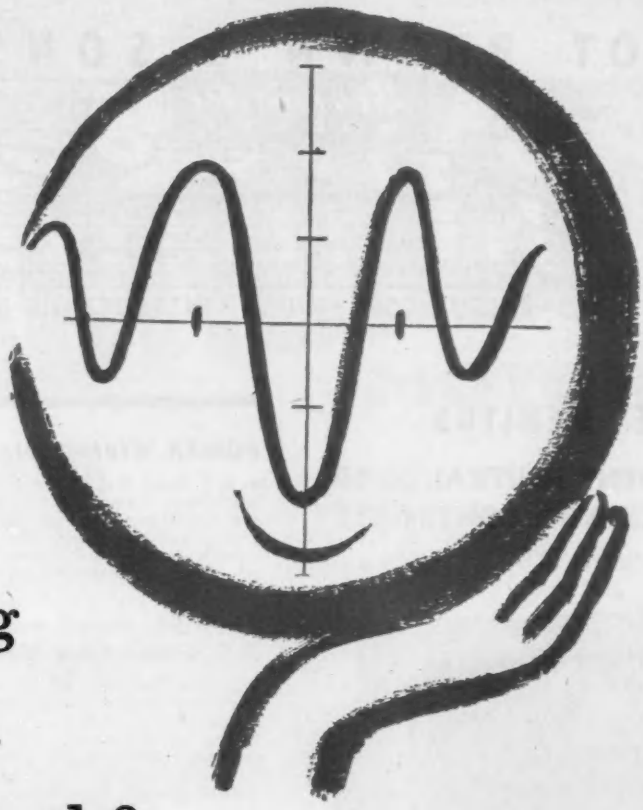
**ALLEN WEST & CO LTD** BRIGHTON ENGLAND · Telephone: Brighton 23291 · Telegrams: Control, Brighton
*Engineers and Manufacturers of Electric Motor Control Gear and Switchgear*
SUBSIDIARY COMPANIES IN CANADA, SOUTH AFRICA AND RHODESIA · AGENCIES THROUGHOUT THE WORLD



**Engineers' Language!** For every Plant Engineer who swears at Collins, there are ninety-eight and a quarter who swear by them. Engineers being engineers, this is quite something. As we were saying, we show two 1500kW 240-volt 600 r.p.m. D.C. Generators, one being stripped out for rewinding, t'other being rewound.

COLLINS

*Collins Electrical Ltd.*
*Head Office* 115 *Clerkenwell Road London E C* 1
*Central London Works*
22 *St. Albans Place Upper Street Islington N* 1
*West London Works*
9 *&* 11 *Featherstone Road Southall*
*Phone Holborn* 0212-4 *Canonbury* 3227-8
*or Southall* 0168



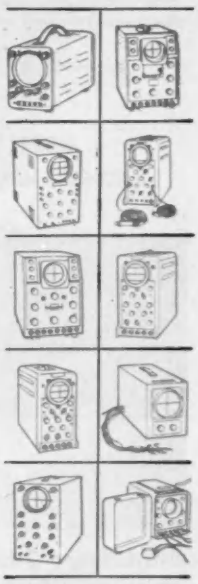
# Thinking about an oscillograph?

*If you are experienced in the design of high quality instruments, our Technical Director would be glad to hear from you.*

**FOR USE IN ELECTRONICS?** From the wide range of single and double-beam instruments, a model is available to suit the requirements of all sections of this expanding industry.

**IN INDUSTRY?** Diverse industries are finding solutions to their design and production difficulties with the aid of the Cathode Ray Oscillograph. Our Technical Advisory Service will be pleased to help you with your specific problem.

**IN SPECIALISED FIELDS?** Unusual types of oscillograph have been designed for specialised applications in the Hydraulic, Marine and Ultrasonic fields. We shall be pleased to consider specific development projects.



*For technical information, write to:*

**COSSOR INSTRUMENTS LIMITED**

*The Instrument Company of the Cossor Group*

COSSOR HOUSE, P.O. BOX 64, HIGHBURY GROVE, N.5, ENGLAND
Telephone: CANonbury 1234 (33 lines) Telegrams: COSSOR, NORPHONE, LONDON Codes: BENTLEY'S SECOND Cables: COSSOR, LONDON
TAS/CL.I

# ABBOT BROWN & SONS, LTD.

SCALES · DIALS · CALCULATORS · RULES · INSTRUCTION & NAMEPLATES

## THE MERITUS

### HIGH CURRENT NEUTRAL LOOP IMPEDANCE AND CONTINUITY TESTER

SHOCKPROOF AND SAFE
FOR OPERATOR AND INSTRUMENT

This instrument will SAFELY carry out tests on electrical installations and appliances as recommended in the I.E.E. Regulations, 13th Edition, 1955, Section 5.

**MERITUS (BARNET) LTD.**
**BARNET, HERTS.** **Bar. 2291/2**

## *POWER WIRING DIAGRAMS*

By A. T. Dover, M.I.E.E., A.M.A.I.E.E. 4th Edition. The new edition of this book contains over 200 carefully prepared diagrams of connections of electric power circuits, each diagram being accompanied by explanatory notes. It also contains a collection of useful data, curves, etc., relating to starters and protective apparatus.
16/- net.

## *The Performance and Design of A.C. Commutator Motors*

By E. Openshaw Taylor, B.Sc., A.C.G.I., etc. This new book provides a good overall knowledge of all types of A.C. commutator motors. Part I covers matters common to all types of commutator motors, while the remaining three parts deal with the commercially successful types — a detailed account being given of each machine. Pitman's "Engineering Degree" Series. 45/- net.

## *BASIC ELECTRICAL ENGINEERING*

By J. Shepherd, B.Sc., etc., A. H. Morton, B.Sc., etc., and L. F. Spence, B.Sc., etc. A clear and concise introduction to electrical engineering for students in the second and the third years of the O.N.C. course. Of value also to those working for the Intermediate Standard in C. and G. Electrical Engineering Practice and for the London B.Sc.(Eng.) Part I. 27/6 net.

**PITMAN** *TECHNICAL BOOKS*
Parker Street, Kingsway
London, WC2

**Studding · Studs · Allthreads · Tie Rods**
TELCO LTD., 3 Newman Street, London, W.1 MUSeum 5701/4

## INSULATING SHROUDS FOR LINE TAPS
TO B.E. SPECIFICATION

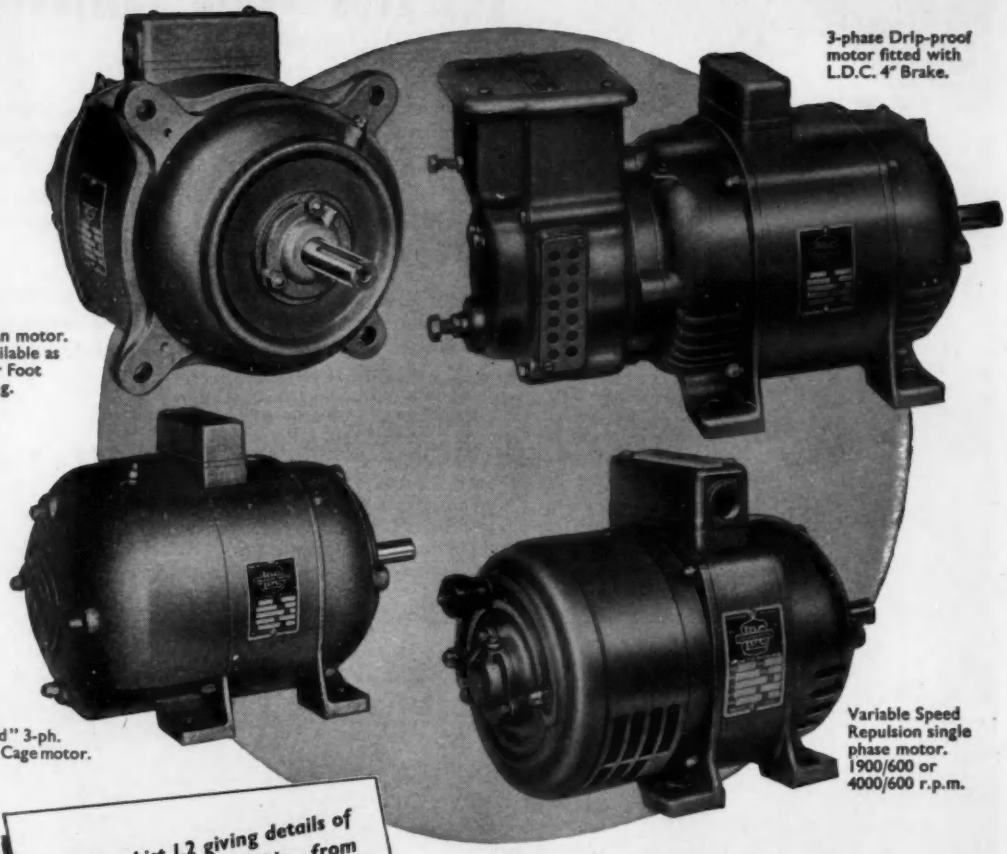
HOME AND EXPORT ENQUIRIES INVITED

Plastic Mouldings
*PHENOLIC AND UREA*

**T. BLACKWELL & SON LTD.** *Phone: Waltham Cross 2430*
Brooker Road, Waltham Abbey, Essex

LANCASHIRE CRYPTO LDC

# FRACTIONAL H.P. MOTORS



3-phase Drip-proof motor fitted with L.D.C. 4" Brake.

4-Lug Fan motor. Also available as 3-Lug or Foot mounting.

Typical "Fankuld" 3-ph. Squirrel Cage motor.

Variable Speed Repulsion single phase motor. 1900/600 or 4000/600 r.p.m.

Send for List J.2 giving details of F.H.P. Motors available from Stock. 3-phase, Single-phase and D.C.

**A selection of types from our extensive range**

## LANCASHIRE DYNAMO & CRYPTO LTD

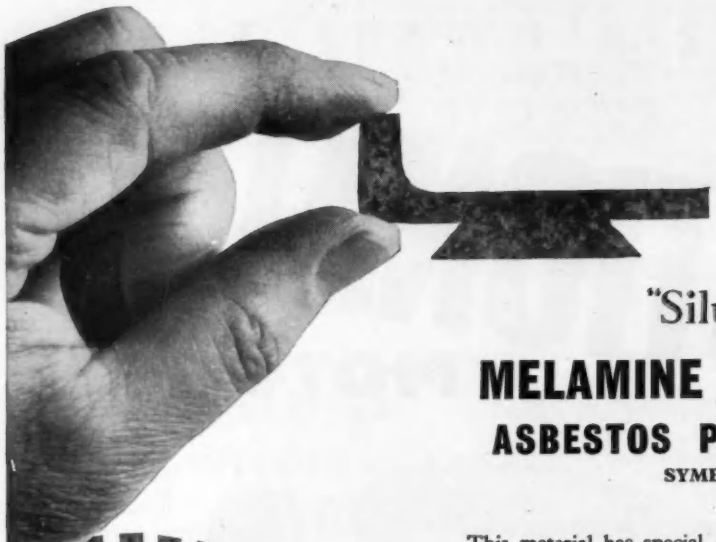
TRAFFORD PARK, MANCHESTER 17 · ACTON LANE, WILLESDEN, LONDON, N.W.10

*London & Export Office:* ST. STEPHEN'S HOUSE, VICTORIA EMBANKMENT, WESTMINSTER, LONDON, S.W.1

FR.4

LANCASHIRE CRYPTO LDC

The Symbol of Power and Service for over 50 years



"Siluminite"

# MELAMINE RESIN BONDED
## ASBESTOS PAPER LAMINATES

**SYMBOL No. MELS.2**

This material has special characteristics of non-inflammability and extremely high resistance to surface tracking. It is mechanically strong with very small compression yield, low moisture absorption and high resistance to oil and chemicals. Electrically it is suitable for medium voltage applications, and continuous operating temperatures up to 130°C. (Class 'B').

"Siluminite" MELS.2 in thin sections offers the additional attraction of low-cost clean punchings, with an absence of flaking troubles, and is used in considerable quantity to form inter-segment spacers for commutators similar to those illustrated.

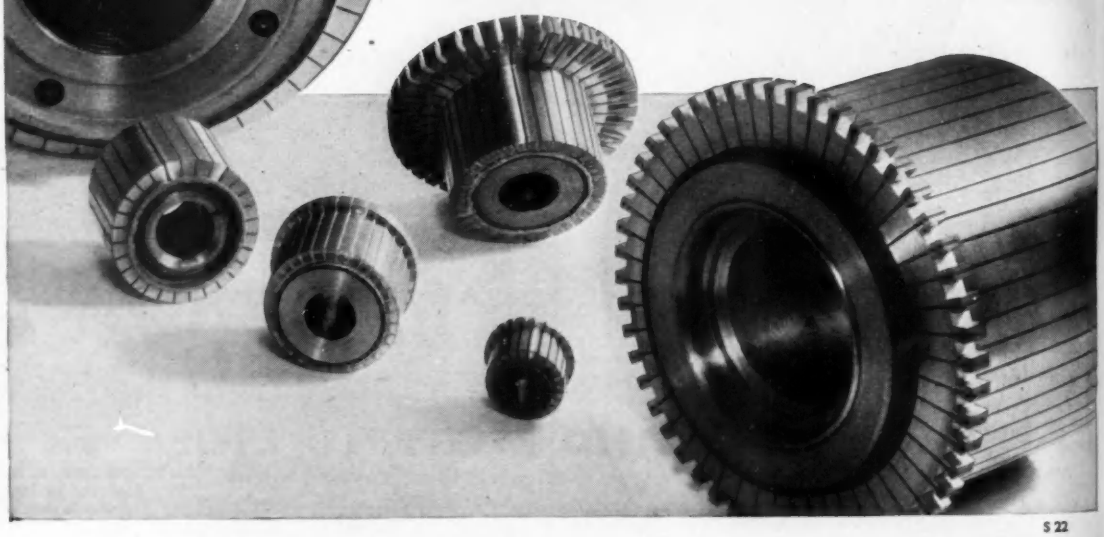
TURNERS ASBESTOS CEMENT CO. LTD.

A MEMBER OF THE TURNER & NEWALL ORGANISATION

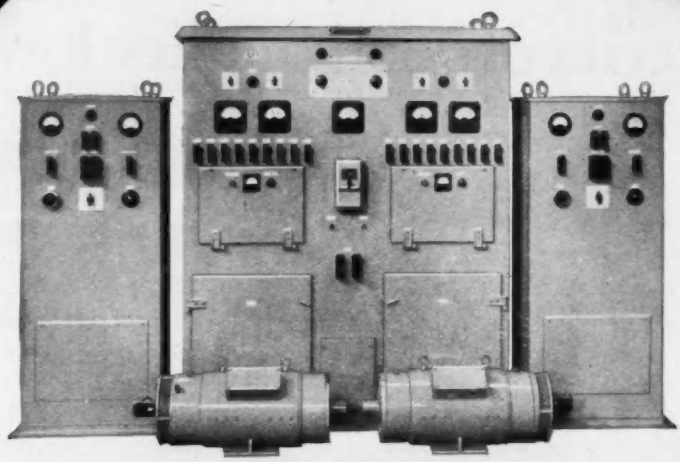
**ELECTRICAL INSULATION DEPT. TRAFFORD PARK MANCHESTER 17**

***Telephone: Trafford Park 2181***

*Commutators reproduced by courtesy of Franklin & Freeman (London) Ltd Commutator Manufacturers*



S 22



# keep us in mind

For nearly 40 years Electro Dynamic Construction Company have manufactured electrical machinery and control gear for special purposes. Here is an example—an installation for providing an uninterrupted closely controlled 50-cycle A.C. supply. It was manufactured for the U.K.A.E.A. The equipment comprises a motor-generator set with tachometer generator; 2 transformer/rectifier cubicles which supply D.C. to a motor alternator set and charging current to 110-volt stand-by battery; and a main control panel with starting equipment, automatic voltage regulator and an automatic frequency regulator of the electronic type.

The Company is always prepared to investigate customers' problems concerning the use of revolving electrical machinery and control gear, and supply non-standard equipment for a diverse range of projects.

***E.D.C.C. products include***

H.F. alternators . Rotary Convertors . Flame-proof marine motors
Frequency changers . Induction Regulators . Single and Polyphase
alternators . Control gear . Voltage stabilisers
Rotary transformers . Battery traction motors
D.C. Generators
Magnetic couplings etc.

ELECTRO-DYNAMIC

CONSTRUCTION COMPANY LIMITED

ST MARY CRAY KENT PHONE: ORPINGTON 27551 GRAMS: ELEDAMIC ST MARY CRAY

CONTROL GEAR DIVISION: BRIDGWATER SOMERSET TEL: BRIDGWATER 2882 GLASGOW OFFICE: 40 HOULDSWORTH ST C3 TEL: CENTRAL 2620

H

P.1189

# Introducing the atlas

## a series of good quality low priced

*single or twin tubes*

*tabped for all voltages*

*prepacked —*

*complete with Atlas White tube(s)*

With sales already nearing the million mark, the Atlas Popular pack is vivid proof of the demand that exists for well-made low priced fluorescent fittings. Here to help you to cater for some of the more specialised industrial and commercial lighting needs are a series of good quality reflector and diffuser fittings, prepacked, complete with bi-pin tubes, for sales off-the-shelf at down to earth prices.

## industrial

**ATLAS KB SERIES—POPULAR 5 ft. 80 w. INDUSTRIAL REFLECTOR FITTING**

complete with chassis, open ended metal reflector, control gear and Atlas White Bi-pin tube. Metal-work stove enamelled white.

**ATLAS KT SERIES—POPULAR 5 ft. 80 w. TROUGH FITTING**

complete with chassis, one piece translucent opal 'Perspex' trough, gear and Atlas White Bi-pin tube.

## commercial

**ATLAS KA SERIES—POPULAR 5 ft. 80 w. ENCLOSED DIFFUSER FITTING**

complete with chassis, reeded opal Perspex diffuser, end plates, gear and Atlas White Bi-pin tube.

**ATLAS KO SERIES—POPULAR 5 ft. 80 w. COMMERCIAL FITTING**

comprising chassis, 'Twin luve' pearl polystyrene diffuser, gear and Atlas White tube. Stove enamelled White. Complies with Ministry of Education requirements for school lighting.

## battens

To the original series of 5ft., 4ft. and 2ft. packs is now added a 5ft. twin tube fitting. All fittings are supplied stove enamelled white, with clip-on plastic end caps, complete with glow-switch, universal gear and Atlas White Tube.

**atlas**

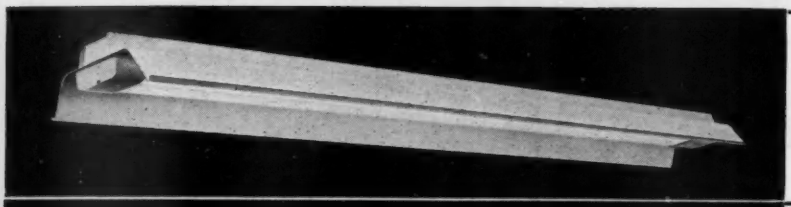
Atlas Lighting Limited

A subsidiary company of Thorn Electrical Industries Ltd.

233 Shaftesbury Avenue, London, W.C.2

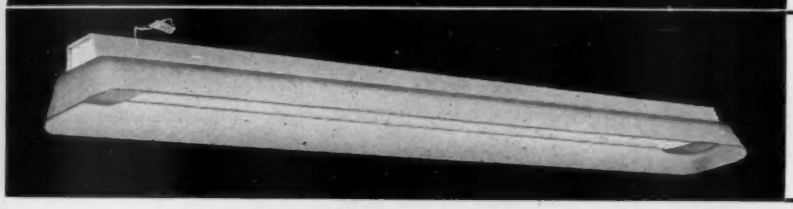
# popular range

## fluorescent lighting fittings



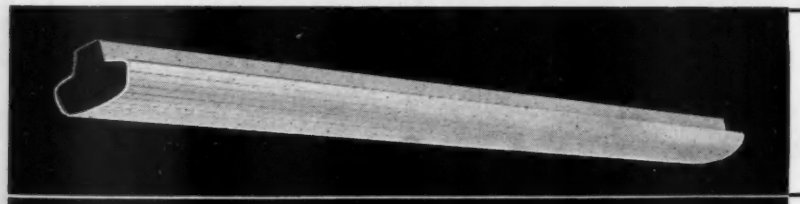
**£7 · 12 · 0**

Twin Tube version **£11·18·0**



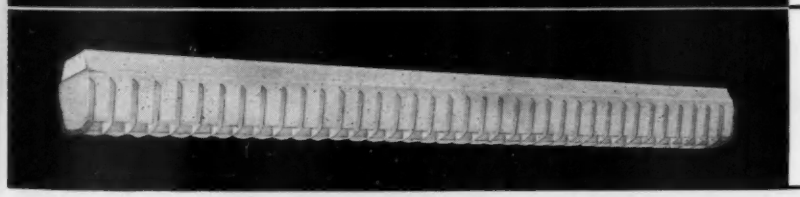
**£10 · 1 · 8**

Twin Tube version **£15·3·4**



**£11 · 18 · 1**

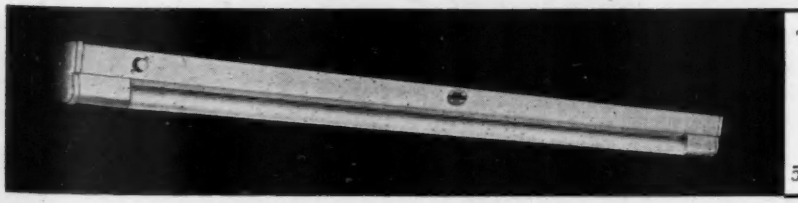
Twin Tube version **£16·9·4**



**£13 · 5 · 5**

Twin Tube version **£17·3·10**
4 ft. single **£10·15·4**
and 4 ft. twin **£13·15·7**

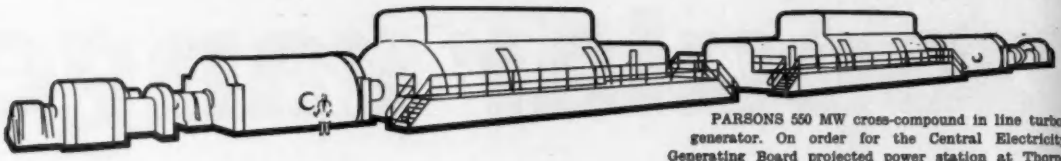
*the original* **Popular** *packs plus a twin tube version*



The original 5 ft. Popular Pack

**£5 · 5 · 0**

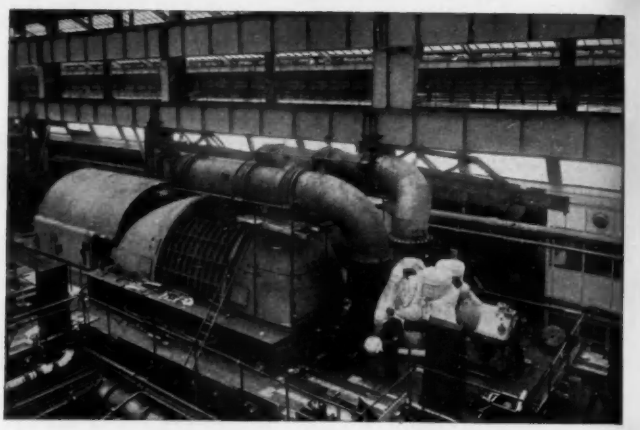
4 ft. Pack **£4·11·0**
2 ft, Pack **£3·10·0**
5 ft. Twin Tube version **£9·13·0**



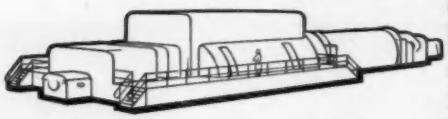
PARSONS 550 MW cross-compound in line turbo-generator. On order for the Central Electricity Generating Board projected power station at Thorpe Marsh. Steam conditions: 2,300 lb/ins² pressure, 1,050°F temperature, reheat to 1,050°F.

# Increasing power output

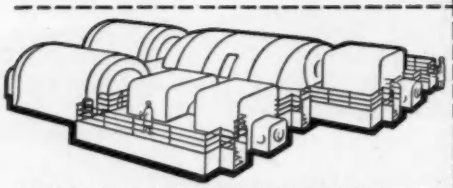
**A significant development in the design of steam turbo-generators for power stations is the increase in the power output of individual machines. This is evident in the range of large turbo-generators now under construction at Heaton Works.**



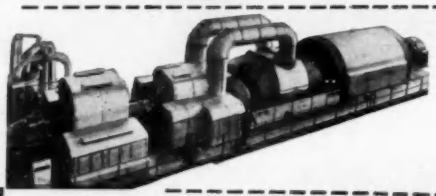
PARSONS 200 MW cross-compound turbo-generator (View of low pressure line only). Four of these machines are under construction for the Hydro Electric Power Commission of Ontario, Richard L. Hearn Generating Station. Steam conditions: 1,800 lb/ins² pressure, 1,000°F temperature, reheat to 1,000°F.



PARSONS 200 MW in line turbo-generator. Two machines are on order for the Central Electricity Generating Board, West Thurrock Power Station. Steam conditions: 2,350 lb/ins² pressure, 1,050°F temperature, reheat to 1,000°F.



PARSONS 300 MW cross-compound turbo-generator. Two machines on order for the Hydro Electric Power Commission of Ontario, Lakeview Generating Station. Steam conditions: 2,350 lb/ins² pressure, 1,000°F temperature, reheat to 1,000°F.



PARSONS 100/120 MW. turbo-generators. Twenty-three of these machines are on order for the Central Electricity Generating Board. Steam conditions: 1,500 lb/ins² pressure, either 975°F or 1,000°F temperature, reheat to 950°F or 1,000°F respectively.

**PARSONS** **Turbo-Generators**

C. A. PARSONS & COMPANY LIMITED · HEATON WORKS · NEWCASTLE UPON TYNE 6

REGISTERED

# MUDIE'S CUBICLE SWITCHGEAR

TRADE MARK

FRONT ACCESS TYPE
for service up to 5000 amps
at 660 volts

MUDIE'S ELECTRICAL CO. LTD. BIRMINGHAM 28

## THE AUTOMATIC CHOICE FOR ACCURACY

With the modern engineer who looks for the most exacting standards, one name springs to mind when time delay mechanisms are being considered. He knows that Rotherham's unrivalled experience over the longest period of specialisation is a positive assurance of the finest quality.

Write to Rotherhams about all your needs in Industrial Clocks, Pressure Gauge Movements, Time Lags and all small parts for Engineering.

Rotherhams OF COVENTRY

*Precision Manufacturers since 1750*

ROTHERHAM & SONS LTD., COVENTRY
*Telephone: 64154*

## NEWALL adjustable GIRDER CLIPS

NOW IN GENERAL USE ALL OVER THE ~~COUNTRY~~ WORLD

For your new factory or rewiring your existing premises.

Fit all types and sizes of Girders and accommodate Conduit and Tubes from ½" to 3½" o.d.

*Prices and Fully illustrated catalogue from the Sole Manufacturers:*

## EVANS & NEWALL LTD.

GIRDER CLIP DIVISION
MOOR TOP WORKS, HEATON MOOR, STOCKPORT
CHESHIRE ENGLAND

*Telephone: HEAton Moor 2049*
*Telegrams and Cables: FASTCLAMP, STOCKPORT*

SURQUAL

AUTOMATIC STERILIZER

For Efficient Sterilization

- With Automatic Heat Control and Cut-out.
- Seamless Reinforced Boiler.
- Strong lifting device for tray —heat insulated handles.
- In FIVE SIZES from 9" x 5" x 3" up to 20" x 10" x 7".

SES

SURGICAL EQUIPMENT SUPPLIES LTD
WESTFIELDS ROAD, LONDON, W.3
Name of Local Dealers on request

MERCURY SWITCHES

*THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED are the largest specialised manufacturers of Mercury Switches in Great Britain. These are made to exceptionally high and uniform standards of quality.*
*Since its inception in 1932, this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design, manufacture and application.*

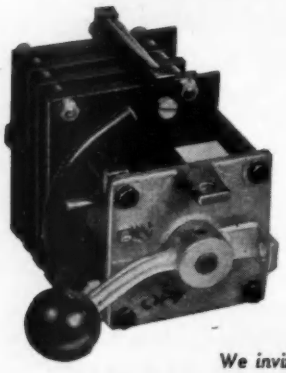
THE MERCURY SWITCH MANUFACTURING CO. LTD.
WEST DRAYTON - MIDDX.
*West Drayton* 3157

MS11

"Colne"

ISOLATOR SWITCHES

660 v. 60 ampere capacity A.C. with door interlock mechanism.



*We invite your enquiries*

*Manufactured by*
Colne
SWITCHGEAR (K & W) LTD.
*formerly Electrical Products (Colne) Ltd.*
Walton Street, Colne, Lancs.
*Phone: Colne 1394/5*

We have the perfect tenant..

This pump is perfectly at home in the deepest well or borehole — the Beresford submersible electric pump, installed below water level, is silent, needs no housing or attention, is easy to install, inexpensive to run — it is, in fact, ideal for domestic, agricultural and industrial water supplies, and can be auto-operated or remote controlled. Thousands are in use — some owners have even forgotten they exist. May we send you descriptive leaflet PF.300?

BERESFORD pumps

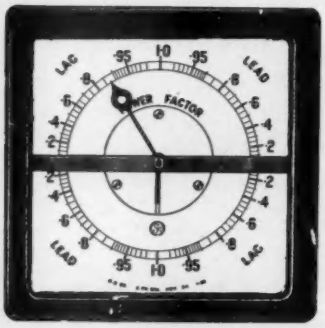
James Beresford & Son Limited
(The Cornercroft Group of Companies)
Ace Works, Kitts Green, Birmingham 33
Telephone: Stechford 3081

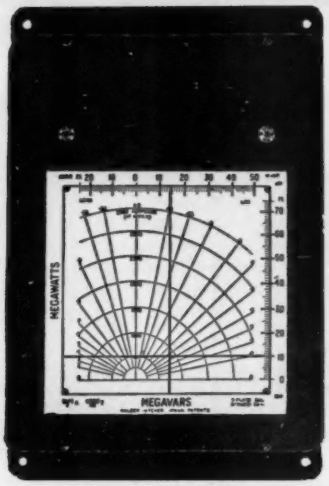
BN.235

# NALDERS

## FOR HIGH QUALITY AND ACCURACY

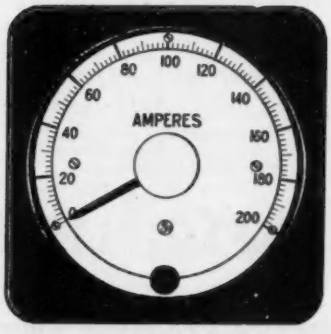
# INSTRUMENTS



## N.C.S. VECTORMETER

The *only* instrument to give simultaneous readings of Megawatts, Megavars, Amperes and Power Factor of the three-phase system in which it is connected. It shows also whether Power is being "Exported" or "Imported." Indication is by two points moving at right angles and in straight lines over a common dial. The Megawatt, Megavar and Ampere scales are each 6 ins. long.




Nalders manufacture a wide range of Electrical Measuring Instruments — indicating, recording, switchboard, portable — high quality being characteristic of every type. All instruments conform to B.S.S.89, cases being of Rectangular, Square, or Round pattern in diecast aluminium or pressed steel, finished bright black stove enamel or other colour to customers' requirements.

**NALDER BROS. & THOMPSON LTD., DALSTON LANE WORKS, LONDON E.8**

*Telephone:* Clissold 2365 (3 Lines) *Telegrams:* Occlude, Hack, London.

BMJ

# 120 HOURS A WEEK

# Non-Stop!

We specialize in the design and manufacture of automatic sequence control panels and have supplied them to practically every industry.

This Control Panel has been designed and built for the sequence control of synthetic resin coated sand processing. The machine operates 5 days a week—day and night—non-stop producing 1½ tons of coated sand every hour. After loading the hoists the Panel automatically controls all process operations including discharge into the sacks. The Floor Mounted Controller incorporates H.R.C. fuses and heavy duty automatic starters for all motors which total 100 horse power. Mounted on the Panel are 6 visible continuously adjustable dial process timers with tamper proof operation counter giving full automatic control of the coating operations with manual control for sampling. This method of automatic control definitely reduces production costs. Scrap caused by incorrect mixing by hand is entirely eliminated and uniformity in batch production constantly maintained.

**May we receive your enquiries - We are confident that our suggestions will save you time and product cost!**

*Send for our catalogue illustrating special panels and complete range of Standard Motor Control equipment.*

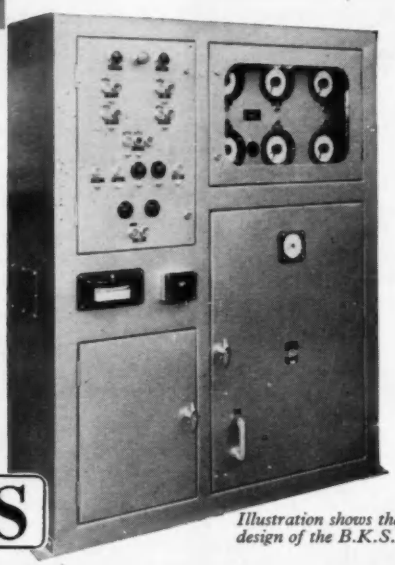


*Illustration shows the compact design of the B.K.S. Panel.*

BKS

## SPECIALISTS IN ELECTRICAL CONTROL

*post this coupon today*

**BRITISH KLOCKNER SWITCHGEAR LTD.**
HEAD OFFICE & WORKS: **CHERTSEY, SURREY.**
*Telephone: Chertsey 3467*

**LONDON:** Refer to Head Office.
**MANCHESTER:** Cromford House, Cromford Court, Manchester 4. Tel: BLAckfriars 3903.
**GLASGOW:** 249, St. Vincent Street, Glasgow C.2. Tel: CENtral 2479.
**NEWCASTLE:** Mr. H. Breeze 4, Beechwood Avenue, Monkseaton, Whitley Bay, Northumberland, Tel: Whitley Bay, 24231.
**BIRMINGHAM:** Mr. J. Perry, 45, Streetly Crescent, Four Oaks, Sutton Coldfield. Warwickshire. Tel: Streetly 1641
**DUBLIN:** Mr. H.E. Kilbride-Jones, 11, Crow Street, Dublin. Tel: Dublin 71717.

**To BRITISH KLOCKNER SWITCHGEAR LTD.**
**CHERTSEY, SURREY.**

*Please send me your latest comprehensive catalogue.*

**NAME**.....

**POSITION**.....

**FIRM**.....

**ADDRESS**.....

ER/10/58

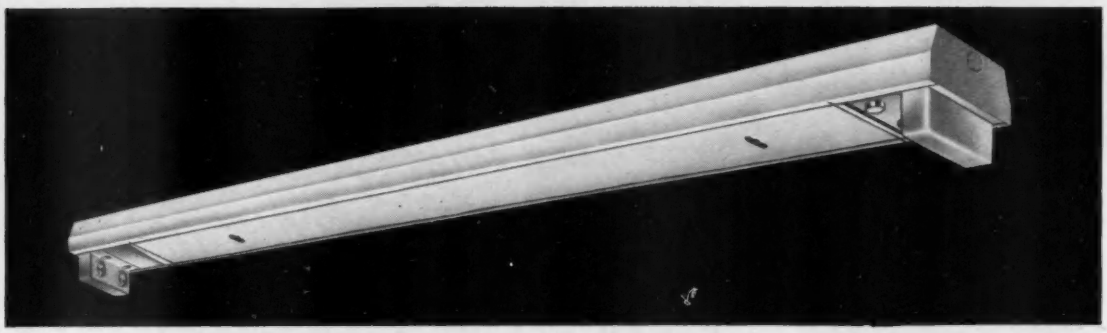
# You must see the

# * Revolutionary

# EKCO Essex Range

PATENT APPLIED FOR

## Over 200 Fluorescent Fittings from One Basic Spine



Fittings designed with the User in mind. An entirely new range of fluorescent lighting fittings, produced by experts with many years experience, to combat the ever-rising costs of installation and maintenance.

The **Essex Range** prices are very competitive with those of any fittings of the same standard, but only the **Essex Range** has all the precision built-in refinements such as:—

*Detachable control gear tray, quick-fix reflectors and diffusers, heavy duty bi-pin lampholders permitting lamping from one position, no projecting screwheads on spine and many others.*

Ask for a copy of the **Ekco Essex Range** Catalogue and see how good fluorescent lighting fittings can be.

- ***Installation and maintenance cost halved.***
- ***Assembly by one man in two minutes.***
- ***Full range of quick-fix metal and plastic reflectors with open or closed ends.***
- ***Modern diffusers with coloured endplates—quickly detachable for ease of maintenance.***

**INSTALLATION IS A ONE MAN JOB!**

**1** *Empty spine easily fixed to conduit, chain, universal suspension or ceiling. The 5ft. spine weighs only 7 lbs.*

**2** *Control gear tray hooked at one end into spine, hangs vertically leaving both hands free to make connections. Tray swung into final position and firmly fixed with captive wing nut.*

**3** *Ready wired lampholder assemblies slotted into spine. The gear tray and lampholders for the single 80W fitting weigh only 9 lbs.*

**4** *Reflector or coverplate attached to fitting by two turn-buttons. Tube(s) inserted into spring-loaded lampholders.*

# EKCO Essex Range of Fluorescent Fittings

**EKCO-ENSIGN ELECTRIC LTD.** 45 ESSEX STREET, STRAND, W.C.2. TEL: CITY 8951

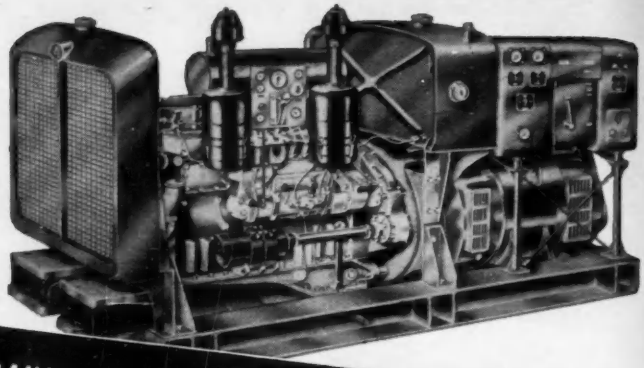
SALES OFFICES, ILLUMINATING ENGINEERING DEPT., SHOWROOMS AND DEPOTS IN

LONDON · MANCHESTER · BIRMINGHAM · NOTTINGHAM · GLASGOW · CARDIFF

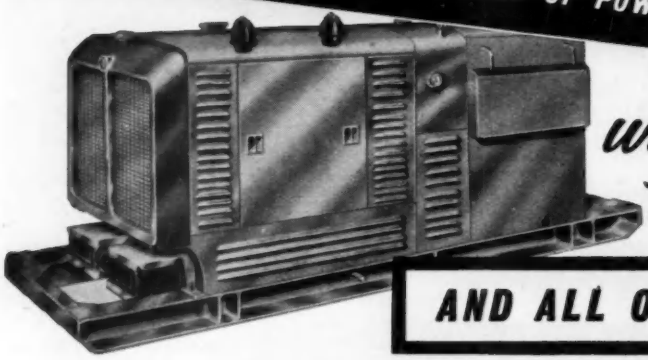
EL60

MEADOWS

now introduce



THE MOST COMPREHENSIVE RANGE OF POWER UNITS AVAILABLE TODAY



with 5000 variants to choose from...

AND ALL OF THEM STANDARD!

Based on the six well proven Meadows diesel engines, a new range of Power units is now available, providing generating sets from 22-161 kW and power packs from 35-235 S.H.P.

Maximum interchangeability of components and world wide spares and service facilities through a network of agents ensure a long life of trouble-free operation.

**DOMINANT FEATURES:**

Low prices and higher outputs give reduced cost per k.W.

Adaptability to virtually any specification by selection from a wide range of variants.

Extended power range and consolidated range of outputs.

Unit construction for maximum economy in assembly and interchangeability of components.

More competitive through a wide use of standard proprietary components.

Common set and engine components allow a wide degree of interchangeability throughout range.

Virtually any make of generator may be incorporated in the sets.

Sets available from bare power plants to completely self-contained trailer mounted fully canopied units.

You've a specification? - It will surprise us if we can't meet it!

Write now for fully illustrated and comprehensive free literature on the New Range.

HENRY MEADOWS LIMITED

ELECTRICAL EQUIPMENT DIVISION,

FALLINGS PARK, WOLVERHAMPTON

*Telephone: Wolverhampton 31921*

*Telegrams and Cables: OUTPUT, Wolverhampton*

*London Office: 37/41 BEDFORD ROW, LONDON, W.C.1 HOLBORN 6881/5*

*AN ASSOCIATED BRITISH ENGINEERING COMPANY*

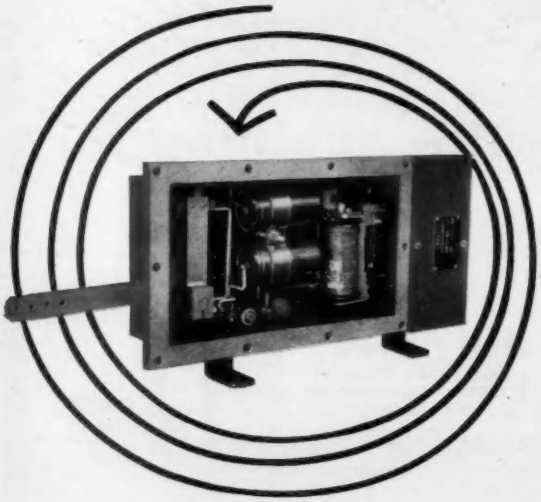
MID 74

LONDEX

# ROTATION SENSING DEVICE

Type RSD

for detecting stoppage of rotating machinery



The RSD Unit is a reliable and not expensive device for providing an alarm on the stoppage of rotating machinery used for continuous processing.

The unit is easily installed, there being no critical alignment with the monitored drive; functional tests can be carried out by unskilled labour and this need not interfere with the drive.

*Write for list No. 176*

**LONDEX LTD**

Manufacturers of automatic electrical control apparatus.
ANERLEY WORKS, LONDON, S.E.20
*Telephone: SYDenham 3111*

"ELMO"

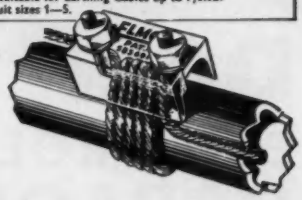
# EARTHING CLAMPS

## A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

| | A123 | B45 | C67 | D8910 |
|---|---|---|---|---|
| for earthing cables up to | 7/0.036" | 7/0.064" | 19/0.064" | 19/0.083" |
| to fit B.S. conduit sizes i.e. in trade terms | 1, 2 & 3 ⅜" to ¾" | 4 & 5 1" and 1¼" | 6 & 7 1½" and 2" | 8, 9 & 10 2½" to 3½" |

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.

"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

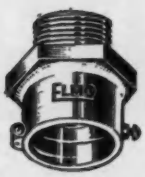


# ELECTRICAL FITTINGS

Flexible-to-rigid
## CONDUIT COUPLINGS

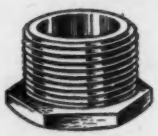
Made in zinc base alloy in the following sizes

| | | | | | | |
|---|---|---|---|---|---|---|
| Electric Thread (Male) | ⅜" | ¾" | 1" | 1¼" | 1½" | 2" |
| Inside Diameter | ⅜" | ¾" | 1" | 1¼" | 1½" | 2" |
| Electric Thread (Male) | | ⅜" | ¾" | 1" | 1¼" | |
| Inside Diameter Flexible Conduit | | ¾" | ⅜" | ¾" | 1" | |



## WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.



MALE
Hex. Section

## CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread
⅜" ¾" 1" 1¼" 1½" 2"

FEMALE: Electric Thread
⅜" ¾" 1" 1¼" 1½" 2"

FEMALE
Flat Face Section for Spanner (except ⅜" size, which is round)

## CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ⅜" thread, male electric.

Made to fit all standard boxes with two holes 7/32" diameter — 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

Both made in aluminium alloy

## CEILING PLATE

One hook

Manufactured by M. MOLE & SON LTD.
BIRMINGHAM · 3 · ENGLAND Est. 1835

# TAKE YOUR PICK

Our wide range of capacitors, incorporating all the very latest developments, are described fully in these new leaflets . . .

**SEND NOW for COPIES**

DALY has succeeded in maintaining full capacity values and working voltages in more compact designs, specially suited to ultra-modern equipment:

*PHOTO-FLASH EQUIPMENT • DEAF AIDS*
*PRIVATE TELEPHONE INSTALLATIONS*
*AMPLIFIERS • D.C. POWER UNITS*
*TRANSISTOR EQUIPMENT*
*MAGNETISATION EQUIPMENT*
*TEST GEAR*

# DALY
## ELECTROLYTIC CAPACITORS

*Condenser Specialists for over 20 years.*

**DALY** *(Condensers)* **LTD.,** WEST LODGE WORKS,
THE GREEN, EALING, LONDON, W.5. PHONE: EALING 3127-8-9. CABLES: DALCYON, LONDON

# Bridge-Banbury
**MIXERS**

Produce the
**Highest Output**
more quickly, more efficiently, and guarantee a more uniform and
**Highest Quality**
mix. By minimising manual operating they produce at
**Lowest Costs** with the maximum degree of dependability and safety.

*Consult our engineering service on layouts and machines for rubber and plastics. Our catalogue BB200 is yours for the asking.*

*In technical association with Farrel-Birmingham Co. Inc. U.S.A.*

SIZE 11 BRIDGE–BANBURY

**BRIDGE-BANBURY** *Automation*

**DAVID BRIDGE & CO. LTD.,** CASTLETON, ROCHDALE, LANCS
Phone: CASTLETON (ROCHDALE) 57216 Grams: Coupling Phone Castleton Lancs
LONDON OFFICE: BROUGHTON HOUSE, 6-7-8 SACKVILLE STREET, PICCADILLY, W.1
Phone: REGENT 7480 Grams and Cables: "EDERACEO" Piccy London

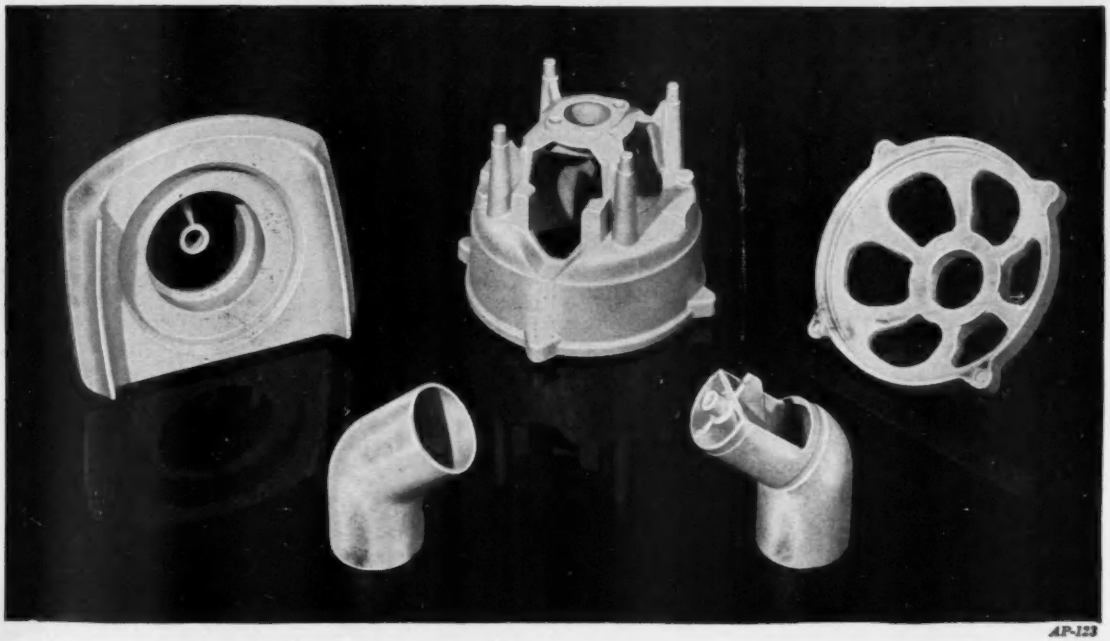
*Electrolux cylinder type Suction Cleaner model 62 and accessories.*

# Aluminium Alloy Castings

## by William Mills Limited

FRIAR PARK FOUNDRY · FRIAR PARK ROAD · WEDNESBURY · STAFFS.

*Photographs by courtesy of Electrolux Ltd., London, W.1.*

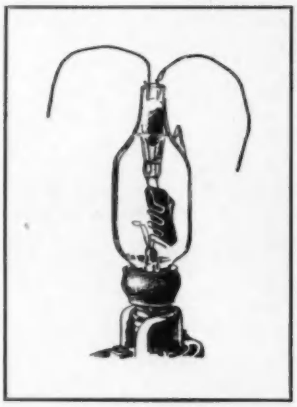


AP-123

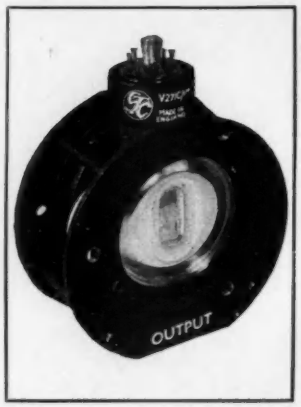
# THE THIRD ELECTRODE–
## *basis of a new industry...*

One of the really great discoveries in the history of telecommunications was the "Audion". The year was 1907 and the best brains in the telephone industry were working on the problem of speech amplification and retransmission. By adding a grid, or third electrode, to Fleming's recently developed thermionic valve, Dr. Lee de Forrest of Standard Telephones and Cables (then called the Western Electric Company) gave the industry its first satisfactory amplifier and overcame the major obstacle in the way of long distance telephony.

In the succeeding half century STC pioneered many of the most important advances in electronic valves. The celebrated 'Peanut' valve — only 2 inches high and ½ inch diameter and widely used in domestic radio of the day — was an STC development. So too was the first water cooled valve with a copper-to-glass sealed anode. This latter opening the field for intercontinental high power radio systems. More recently the pioneering of the travelling wave amplifier tube paved the way for the first permanent SHF T.V. link from Manchester to Edinburgh.



In this complex branch of the industry, research is more intense than ever. STC scientists are working to extend cathode life, to increase the figure of merit, to extend the top limiting frequency of operation and, in fact, examine every lead that may result in better communications. For to-day as in the past, leadership in telecommunications is *Standard* practice.




**Standard Telephones and Cables Limited**

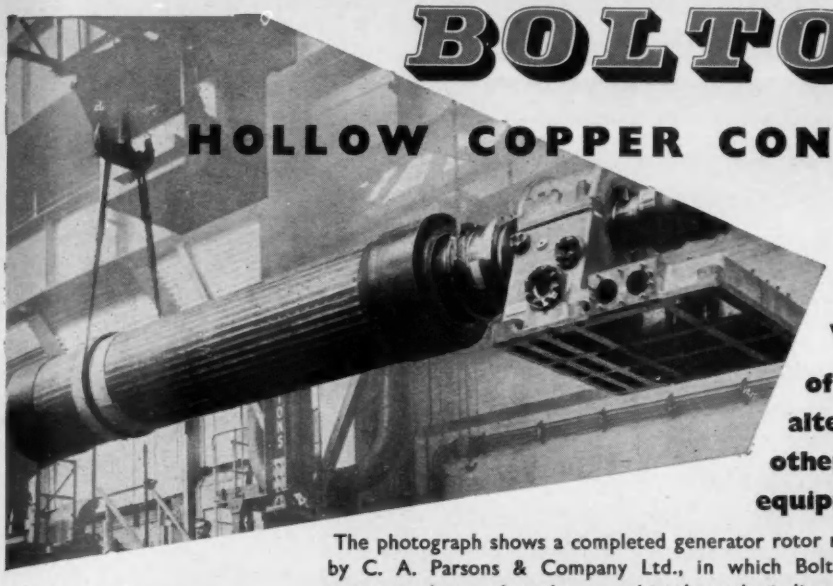
TELECOMMUNICATION ENGINEERS

CONNAUGHT HOUSE · ALDWYCH · LONDON · W·C·2

CAIRO · DUBLIN · JOHANNESBURG · KARACHI · NEW DELHI · SALISBURY

# BOLTON'S

## HOLLOW COPPER CONDUCTORS



**for rotor and stator windings of direct-cooled alternators and other electrical equipment.**

*Photograph by courtesy of C. A. Parsons & Co. Ltd.,*

The photograph shows a completed generator rotor manufactured by C. A. Parsons & Company Ltd., in which Bolton's hollow copper conductors have been used in the end windings. The rotor is being removed from the high speed generator which is part of a 200 MW cross-compound turbo-generator for the Richard L. Hearn generating station, Toronto, Canada.

THOMAS BOLTON & SONS LTD — 175 YEARS SERVICE TO INDUSTRY

**THOMAS BOLTON & SONS LTD**

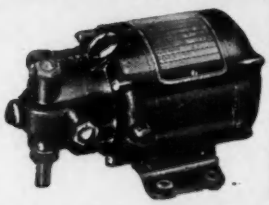
Head Office: MERSEY COPPER WORKS, WIDNES, LANCASHIRE. *Telephone:* Widnes 2022
London Office & Export Sales Department: 168 Regent Street, W.1. *Telephone:* REGent 6427

B-326

Citenco

## WORLD FAMOUS FRACTIONAL HORSE-POWER GEARED MOTORS

Output-shaft has 12 positions. Integral Wormgear Reduction. Ventilated—Drip Proof. Vacuum Impregnated Windings. Dynamically balanced Armatures and Rotors.



**SERIES WOUND GEARED MOTOR—Type 'K'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 600 | 10 oz. in. | 37.5 | 4 lb. in. |
| 300 | 16 oz. in. | 25 | 4 lb. in. |
| 150 | 24 oz. in. | 18.8 | 4 lb. in. |
| 100 | 32 oz. in. | 12.5 | 4 lb. in. |
| 75 | 36 oz. in. | 9.4 | 4 lb. in. |
| 50 | 3 lb. in. | 6.25 | 4 lb. in. |

**SHADED-POLE INDUCTION GEARED MOTOR—Type 'FA'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 216 | 4 oz. in. | 13.5 | 24 oz. in. |
| 108 | 7 oz. in. | 9 | 30 oz. in. |
| 54 | 10 oz. in. | 6.7 | 35 oz. in. |
| 36 | 12 oz. in. | 4.5 | 44 oz. in. |
| 27 | 15 oz. in. | 3.35 | 3 lb. in. |
| 18 | 20 oz. in. | 2.25 | 4 lb. in. |

**VARIABLE SPEED GEARED MOTOR—Type 'KQ'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 200-600 | 9 oz. in. | 12-37.5 | 4 lb. in. |
| 100-300 | 16 oz. in. | 8-22 | 4 lb. in. |
| 50-150 | 20 oz. in. | 6-16.5 | 4 lb. in. |
| 32-100 | 32 oz. in. | 4-11 | 4 lb. in. |
| 25- 75 | 40 oz. in. | 3- 8.25 | 4 lb. in. |
| 16- 50 | 48 oz. in. | 2- 5.5 | 4 lb. in. |

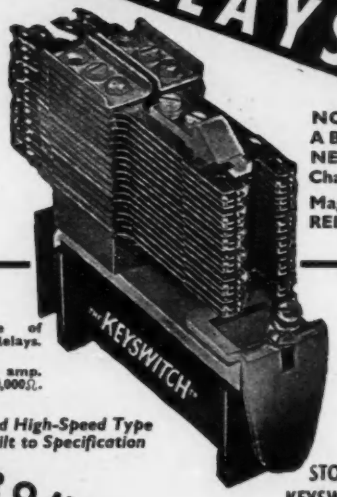
**CAPACITOR INDUCTION GEARED MOTOR—Type 'N'**

| R.P.M. | TORQUE | R.P.M. | TORQUE |
|---|---|---|---|
| 456 | 8 oz. in. | 28.5 | 3 lb. in. |
| 228 | 13 oz. in. | 19 | 4 lb. in. |
| 114 | 21 oz. in. | 14.2 | 4 lb. in. |
| 76 | 26 oz. in. | 9.5 | 4 lb. in. |
| 57 | 32 oz. in. | 7.1 | 4 lb. in. |
| 38 | 44 oz. in. | 4.75 | 4 lb. in. |

**CITY ENGINEERING CO. (Boreham Wood) LTD.**

MANOR WAY - BOREHAM WOOD HERTS - ENGLAND
*Telegrams:* Citenco Borehamwood. *Telephone:* Elstree 3666-7-8

## RELAYS




**NOW! A BRAND NEW 12 Changeover Magnetic RELAY**

Enormous range of 3,000 P.O. Type Relays.
CONTACTS: 300 m/A to 8 amp.
COILS: Up to 100,000Ω.

*P.O. 600 and High-Speed Type Relays. Built to Specification*

LARGE STOCKS OF KEYSWITCHES

PROMPT DELIVERY

THE KEYSWITCH CO.
2 Irongate Wharf Rd., Praed St., London, W.2 PAD 2231/2 3
Contractors to Home and Overseas Governments and H.M. Crown Agents.

*A vast new spin dryer market is now extended to every home in Britain*

**are you taking advantage of the SATURN'S popularity**

Ever since national advertising introduced the SATURN Spin Dryer thousands of women have been clamouring for it. Because it's the Spin Dryer everyone can afford it opens up a vast new market and opportunities of fabulous new business.

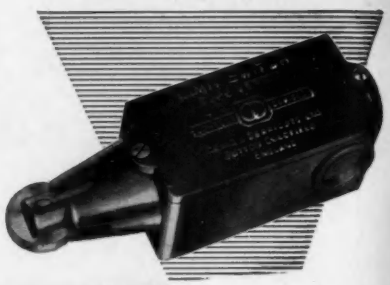
If you're not yet stocking the Saturn how about ringing your wholesaler —today.

WORLD'S MOST PORTABLE SPIN DRYER AT ONLY

**£21·17·6** TAX PAID

Manufactured by Thermair Domestic Appliances Ltd.

Selling Agents: The Brattel Electric Co. Ltd.
27 Old Bond Street, London, W.1 Phone: Hyde Park 8978/0



**LIMIT SWITCHES**

**Compactness & Efficiency . . .**

*Send for our folder giving full details of dimensions and prices.*

Type "V" Limit Switches are especially small and robust and fitted with silver butt type contacts, available with roller or plain plunger or dust and drip proof, in various switching sequences.

**CRAIG & DERRICOTT LTD.**
ROYAL WORKS, SUTTON COLDFIELD, Nr. Birmingham
Tel.: Sutton Coldfield 2547

**FLEXIBLE METALLIC TUBING**

In Steel and Bronze, for all Electrical and Industrial Purposes. Adaptors, Unions, Flanges and other Fitments for Flexible Tubing

We also manufacture CABLE GLANDS and PORTABLE VICES

**PLANT ENGINEERING CO. LTD.**
90-91 COX STREET WEST, BIRMINGHAM 12
*Telephone: CAlthorpe 1551-2*

**MEKELITE**
GEARED JOINT
**INDUSTRIAL LIGHTING UNITS**

For wall, bench or machine mounting. *Catalogue sent free on request.*

**MEK-ELEK** Engineering Ltd., MITcham 3072
17 Western Road, Mitcham, Surrey.

**HIGH BREAKING CAPACITY**

# DISTRIBUTION FUSEBOXES

## WITH Aeroflex 60 AMP FUSES

Suitable for continuous outdoor use, this range of Fluvent High Breaking Capacity Distribution Fuseboxes has been developed for use on British Railways, Southern Region, and has been designed in conjunction with requirements stipulated by the Signals Engineer for the vital purpose of controlling electrically operated signal circuits.

The group consists of six 2-way and one 3-way D.P. 60 amp. aluminium-clad distribution boxes. Aeroflex High Breaking Capacity LDF Fuses have given excellent service over the years in other capacities, and it was decided to use this type of fuse rather than adopt a cheaper modern alternative of equivalent Breaking Capacity. It can be seen from the illustration that fuse-links are equipped with visible positive operation, non-explosive, indicators which show whether or not a fuse has been blown.

## *Parmiter Hope & Sugden Ltd.*

**FLUVENT ELECTRICAL WORKS LONGSIGHT MANCHESTER 12**

**London: 34 Victoria Street, S.W.1. Glasgow: 5 Somerset Place, C.3. Birmingham: 39/41 Carrs Lane, 4**

dm FH 146

Introducing 2 new versatile and compact units for surface hardening and brazing heavy sections

G.E.C.

18 kW and 7 kW

**High Frequency**

# Induction Heaters

Each heater has a power output control to adjust impedance matching of the loads giving optimum conditions for a wide range of applications.

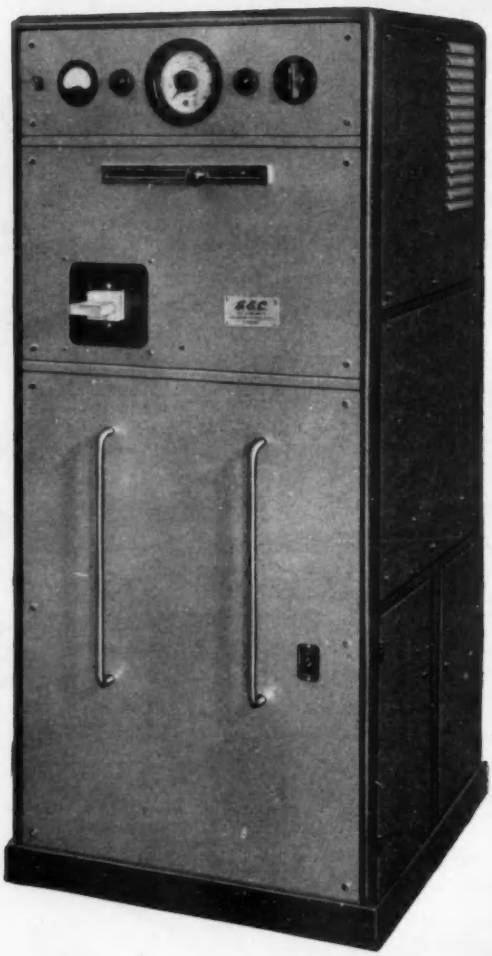
The work coils are easy to make and easy to interchange.

Tank circuit has a high kVA rating, allowing the full available power to be applied to very difficult loads.

Work table supports are fitted on the lower front panel and retracting trunnions are provided at the base to facilitate movement.

Finished in stove-enamelled Oxford blue with front panel stove-enamelled polychromatic silver. Output control guide plate and work table supports chromium plated.

Write for further information.



THE 18 kW HIGH FREQUENCY INDUCTION HEATER

For efficient process heating use

G.E.C. FURNACES • HIGH FREQUENCY • INFRA-RED

THE GENERAL ELECTRIC COMPANY LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

# Classified Advertisements

**CLASSIFIED** advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

**DISPLAYED CLASSIFIED**:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

**SERIES DISCOUNTS** for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

**SITUATIONS WANTED**:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

**REPLIES** to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

**Original testimonials should not be sent with applications for employment**

## OFFICIAL NOTICES, TENDERS, ETC.

### ROTHWELL (YORKS) URBAN DISTRICT COUNCIL

**Proposed Street Lighting, Leeds-Exeter Trunk Road, A.61**

TENDERS are invited for the provision and erection of 102 140-watt Sodium Electric Discharge Street Lighting Units with reinforced or prestressed concrete columns on the above road.

Plans may be seen and conditions of contract, specification and bill of quantities obtained upon application to the Engineer and Surveyor on deposit of two guineas, which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders are to be enclosed in plain sealed envelopes endorsed "Street Lighting, A.61," and returned not later than 9 a.m. on 24th October, 1958, to the undersigned.

ALLEN T. S. ROBERTSON,
Clerk of the Council.

Civic Buildings,
Rothwell, Leeds. 5043

### ELECTRICITY CORPORATION OF NIGERIA

**General Stores and Distribution Materials**

TENDERS are invited for the supply of General Stores and Distribution Materials comprising bare and insulated conductors, underground cables, wood and steel poles, insulators, stays, transformers, feeder-pillars, air-break isolators, switch fuses, joint boxes, compound, etc.

Prepared schedules showing the full list of items required may be obtained upon written application to :—

The Electricity Corporation of Nigeria
Nigeria House
9, Northumberland Avenue
London, W.C.2.

Tenders in duplicate and complete with specifications and drawings, etc., must be returned to the above address in plain sealed envelopes, endorsed "General Stores," so as to arrive not later than noon on Tuesday, 28th October, 1958. 5041

### BOROUGH OF WORKSOP

TENDERS are invited for the provision of ten Fluorescent Lighting Units, 12 Socket Outlets and necessary wiring in a garage at Carlton Road Tip, Worksop.

Tenderers may quote for :—

(a) The supply only of lanterns, tubes and auxiliary gear.
(b) The wiring and fixing of lanterns, etc.
(c) The whole of the work.

Copies of the specification and form of tender may be obtained from the Borough Engineer, Park House, Worksop.

Tenders, in envelopes provided, must be forwarded to the undersigned so as to arrive not later than noon on Friday, the 17th October, 1958.

The Corporation do not bind themselves to accept the lowest or any tender.

W. A. WILLIAMS,
Town Clerk.

Town Hall,
Worksop. 5061

CLASSIFIED ADVERTISEMENTS ARE PREPAID

### BODMIN BOROUGH COUNCIL

**Street Lighting, Group A**

TENDERS are invited for the supply of 20 140-watt Sodium Lanterns complete with auxiliary control gear.

Particulars and documents may be obtained from the Borough Surveyor, Municipal Offices, Priory House, Bodmin. Tenders enclosed in envelopes provided, endorsed "Street Lighting," must be received by the undersigned not later than Wednesday, 22nd October, 1958.

The Council does not bind itself to accept the lowest or any tender.

I. WHITING,
Town Clerk.

Municipal Offices,
Priory House,
Bodmin, Cornwall.
3rd October, 1958. 5060

### STAFFORDSHIRE COUNTY COUNCIL EDUCATION COMMITTEE

**County Technical College, Stafford**

TENDERS are invited for the supply of one 7.5-kW Glass Bulb Mercury Arc Rectifier. Forms of tender and details of requirements may be obtained from the Principal of the College, Tenterbanks, Stafford.

Completed tenders in a plain sealed envelope bearing no mark of the tenderer but endorsed "Tender for Mercury Arc Rectifier" should reach the undersigned by noon on Saturday, 1st November, 1958.

T. H. EVANS,
Clerk to the County Council.
5042

## SITUATIONS VACANT

### THE CEMENTATION COMPANY LIMITED

require an

ELECTRICAL SUPERINTENDENT

for service in India on the Durgapur Project.

The work involves control of power supply to a substantial amount of contractors' plant, and experience is essential in the operation of 11 kV ring mains. Other duties include electrical maintenance of motors, control systems, telephones and temporary lighting. Knowledge of civil engineering plant is very desirable, particularly automatic batching plant and associated relay systems.

The tour is for 2½ years, the first 6-9 months of which is likely to be on a batchelor basis. Generous salary is tax free and subject to site bonus. There is excellent accommodation at nominal rental, and conditions include free passage, free medical attention for family, and paid local and home leave on termination of contract. candidates should preferably be of H.N.C. standard and in the broad age range 28-40.

Applications quoting reference W.24 should be sent to the

**Personnel Administrator**
**THE CEMENTATION COMPANY LIMITED**
**20, Albert Embankment**
**London, S.E.11**

5058

### YORKSHIRE ELECTRICITY BOARD

**Head Office**

PRINCIPAL ASSISTANT (Purchasing and Stores). The successful candidate will be responsible for assisting in the administration of the Board's purchasing and stores organisation.

Candidates should have a knowledge and experience of modern purchasing procedures and methods of stores control.

Salary N.J.C. Grade 9, £1,285/£30/£1,405 per annum.

Applications, quoting H.O.R., and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, near Leeds, not later than 24th October, 1958.

**No. 2 (Huddersfield) Sub-Area**
HALIFAX DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER. Applicants should preferably have the qualifications necessary for election to Corporate Membership of the Institution of Electrical Engineers and have had a sound practical training and experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Salary N.J.B. Class H, Grade 9, £885/£15/£930 per annum.

Applications, quoting 2 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 24th October, 1958.

**No. 6 (Hull) Sub-Area**
GOOLE DISTRICT

ASSISTANT CONSUMERS' ENGINEER. Applicants should have had a sound technical training and practical experience of industrial, commercial and domestic installations. They should be capable of carrying out negotiations with consumers for new and additional supplies, preparing electrical schemes and specifications, and advising on the utilisation of electricity.

Candidates must hold at least the Ordinary National Certificate in Electrical Engineering, or equivalent qualifications.

Salary N.J.B. Class E, Grade 9, £740/£15/£785 per annum.

Applications, quoting 6 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 24th October, 1958.

**No. 7 (Grimsby) Sub-Area**

FOURTH ASSISTANT ENGINEER (Meters, Testing and Protection). Applicants should have had a sound training in electrical engineering and have some knowledge of meter repairing and testing and H.V. protective equipment. The possession of a Higher National Certificate in Electrical Engineering will be an advantage.

Salary N.J.B. Class J, Grade 13, £740/£15/£785 per annum.

Applications, quoting 7 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 24th October, 1958. 5064

*Situations Vacant (continued)*

## CENTRAL ELECTRICITY GENERATING BOARD

### London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for posts (b) an advantage.

(b) MAINTENANCE ENGINEER (Mechanical),
ACTON LANE POWER STATION
(Vacancy No. 58/803).

Applicants should be fully conversant with up-to-date planning methods, supervision and keeping of records. Experience on turbine plant and auxiliaries, together with coal and ash handling plant, is essential. A sound knowledge of the conciliation machinery is required and a good technical background essential. Salary Class J, Grade 6 = £1,210 p.a.

(a) ASSISTANT MAINTENANCE ENGINEER (Mechanical),
BARKING "C" POWER STATION
(Vacancy No. 58/804).

Wide experience necessary in maintenance of modern generating plant and control of labour. Duties include organising and planning of overhauls of turbine and boiler plant and associated equipment. Salary Class J, Grade 8 = £1,045 per annum.

(a) ASSISTANT MAINTENANCE ENGINEER (Instruments),
DEPTFORD EAST POWER STATION
(Vacancy No. 58/805).

Good technical training and practical knowledge of power station instruments, including automatic boiler control systems. Salary Class J, Grade 10 = £935 p.a.

(a) ASSISTANT SHIFT CHARGE ENGINEER,
HACKNEY POWER STATION
(Vacancy No. 58/806).

Experience necessary on modern boiler and turbine plant, P.F. and stoker-fired boilers and E.H.T. switchgear. Salary Class H, Grade 9 = £935 plus £88 10s. shift p.a.

(a) ASSISTANT MAINTENANCE ENGINEER (Instruments),
WEST HAM POWER STATION
(Vacancy No. 58/807).

Experience necessary in maintenance, testing and calibration of all types of power station electrical and mechanical instruments. Salary Class H, Grade 10 = £885 p.a.

(b) SECOND ASSISTANT ENGINEER,
OPERATIONAL RESEARCH DEPT.,
DIVISIONAL H.Q.
(Vacancy No. 58/808).

Candidates must have had a good technical education to H.N.C. or degree standard and preferably some experience in this industry. A knowledge of linear programming and statistical techniques is desirable, and candidates should have had some experience in an operational research department. Salary Class AX/EX, Grade 4 = £1,195-£1,460 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 20th October, 1958. 5028

## SOUTH OF SCOTLAND ELECTRICITY BOARD

### Kincardine Generating Station

APPLICATIONS are invited for the position of MAINTENANCE ENGINEER (Electrical) at the above station.

Applicants should have had considerable experience in the maintenance of electrical equipment in modern power stations, and a detailed knowledge of automatic control systems, air circuit breakers and general instrumentation. Applicants should preferably possess a Higher National Certificate (Electrical).

Salary N.J.B. Class K, Grade 5, £1,325/£1,415 per annum, rising ultimately to Class M, Grade 5, £1,560/£1,665 per annum.

Forms of application may be obtained from the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, and should be returned not later than 24th October, 1958. 5026

## CENTRAL ELECTRICITY GENERATING BOARD

### East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

FOURTH ASSISTANT ENGINEER (Chemist),
GENERATION OPERATION DEPT.,
DIVISIONAL HEADQUARTERS
(LOCATED AT
NORTH WILFORD POWER STATION
(Vacancy No. 149/58/ER).

Applicants should hold the Higher National Certificate in Chemistry and should have had previous experience of analytical work in an industrial laboratory. Previous power station experience is not essential.

The successful applicant will be required to work initially in the field of feed water treatment and air pollution, but will be expected to carry out other duties in the Divisional and Station laboratories, as required.

The salary will be in accordance with Class AX/EX, Grade 8 (£710-£935 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications, 15th October, 1958.

GENERAL ASSISTANT ENGINEER (Chemist),
GENERATION OPERATION DEPT.,
DIVISIONAL HEADQUARTERS
(LOCATED AT
STAYTHORPE POWER STATION
(Vacancy No. 150/58/ER).

Applicants should have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry.

The salary will be in accordance with Class AX/EX, Grade 9 (£550-£705 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications, 15th October, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

DIVISIONAL CONTROLLER.
1st October, 1958. 5027

## MIDLANDS ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER required in the Stone/Market Drayton District.

Applicants should have had a sound technical training and experience in all branches of distribution work, including operation, maintenance and construction of H.V. and L.V. distribution systems, substations, etc. Technical qualifications desirable.

Salary £935/£995 per annum (N.J.B. Grade E.5). Superannuable.

Apply by letter, within 15 days, stating age, experience, present position and salary to Mr. C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

A. STEPHENS,
Secretary.
5059

## MIDDLESEX COUNTY COUNCIL EDUCATION COMMITTEE

### Southall Technical College
### Beaconsfield Road, Southall, Middlesex

REQUIRED for 1st January, 1959, ASSISTANT GRADE B to teach Electrical Engineering subjects in National Certificate Courses. Industrial experience, together with previous teaching experience, desirable.

Burnham (Technical) salary scales, i.e. £650 × £25 to £1,025, plus London and other allowances.

Apply immediately to the Principal (S.A.E.).

C. E. GURR, M.Sc., Ph.D.,
Secretary to the Education Committee.
5066

## WARWICKSHIRE COUNTY COUNCIL

### Architect's Department

APPLICATIONS are invited for the following appointments:—

SENIOR ASSISTANT HEATING ENGINEER, A.P.T. III-IV (£845-£1,175).

Applicants should be Associate Members of the Institution of Heating and Ventilating Engineers and have had several years' experience in the design of heating, water supplies, ventilation, etc., in schools and other public buildings and running of contracts.

ASSISTANT HEATING ENGINEER (£750-£1,030).

Applicants should be Graduates of the Institution of Heating and Ventilating Engineers or hold Higher National Certificate in Electrical and Mechanical Heating and have had some years in the design of heating and water supplies.

ASSISTANT ELECTRICAL ENGINEER (£750-£1,030).

Applicants should possess the Higher National Certificate or be Graduates of the Institution of Electrical Engineers and have had several years' experience in the design of lighting and small power installations.

The appointments are on the established staff and subject to the scheme and conditions of service of the National Joint Council for Local Authorities and also the Local Government Superannuation Acts 1937-1953. The commencing salary can be within the grade according to ability and experience. The council is unable to offer housing accommodation but consideration will be given to the granting of financial assistance towards removal expenses.

Applications are to be on forms which can be obtained from G. R. Barnsley, F.R.I.B.A., County Architect, Shire Hall, Warwick.

L. EDGAR STEPHENS,
Shire Hall, Clerk of the Council.
Warwick.
September, 1958. 4999

A Company of

## THE EXPERT TOOL GROUP

requires

SENIOR DESIGNER-DRAUGHTSMEN

Applicants must have had experience in the design of contactors and relays allied to the

MOTOR CONTROL GEAR FIELD.

They should have received an engineering training and be in possession of H.N.C. or equivalent qualification.

The positions are permanent and salary will be paid commensurate with qualifications and experience.

Please write giving age, present salary and full details to :—

**Chief Draughtsman**
**SHARP CONTROL GEAR LTD.**
**Lount Works**
**Ashby-de-la-Zouch, Leicestershire**

5033

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

### No. 4 Sub-Area

ASSISTANT SECTION ENGINEER required at Holyhead. Salary within range £740/£785 per annum (N.J.B. E/9).

Applicants should have had experience in the construction and operation of overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 16th October, 1958.

Re-issue of advertisement previously authorised 23rd June, 1958. 5018

## SOUTH OF SCOTLAND ELECTRICITY BOARD

**Stirling Area**

APPLICATIONS are invited for the following posts in this Area :—

AREA HEADQUARTERS

1. FOURTH ASSISTANT ENGINEER in the Planning and Development Department (Schedule A, Class J, Grade 12, within scale £790/£835 per annum).
2. FOURTH ASSISTANT ENGINEER in the Test and Protection Department (Schedule A, Class J, Grade 12, within scale £790/£835 per annum).

FALKIRK DISTRICT

3. FIRST ASSISTANT DISTRICT ENGINEER (Schedule A, Class F, Grade 4, within scale £1,065/£1,140 per annum).

Conditions of service will be in accordance with the National Joint Board Agreement and all posts are superannuated.

For Posts 1 and 2, candidates should have had a sound engineering training and experience in the type of work to be undertaken and be in possession of a National Certificate in Electrical Engineering or the equivalent.

For Post 3, candidates must have had a sound technical and practical training in electricity supply, with subsequent experience in the planning, construction, commissioning, operation and maintenance of overhead and underground distribution systems operating at up to and including 33 kV; and preferably hold qualification suitable for admission to Corporate Membership of the Institution of Electrical Engineers.

Application forms, obtainable from the undersigned, are to be submitted not later than 25th October, 1958.

JAMES G. CURTIS,
Area Manager.

Woodlands,
St. Ninians Road, Stirling.
2nd October, 1958. 5068

## CITY OF LIVERPOOL EDUCATION COMMITTEE

**City College of Technology**

Principal: S. A. J. Parsons, B.Sc.(Econ.), M.I.Mech.E., M.I.Prod.E., M.B.I.M.

DEPARTMENT OF ELECTRICAL ENGINEERING

THE Governing Body invite applications for the post of ASSISTANT LECTURER, GRADE B, in ELECTRICAL ENGINEERING. Candidates should be Graduate Members of the Institution of Electrical Engineers, or possess an equivalent qualification. Industrial and/or teaching experience is essential, and some knowledge of Marine Electrical Engineering would be an additional qualification. The work of this College is at an advanced level and research is encouraged.

Salary in accordance with 1956 Burnham Technical Report, as follows :—

ASSISTANT GRADE B (Men):
£650 × £25 to £1,025 per annum.

To this scale, additional graduate and training allowances, where applicable, will be paid. Increments up to a maximum of twelve may be allowed for professional or war service.

Further particulars and application forms (returnable by 25th October, 1958) may be obtained from the Director of Education, 14, Sir Thomas Street, Liverpool, 1.

THOMAS ALKER,
Town Clerk and Clerk to the Local Education Authority.

(J.5332) 5008

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Chester District. Salary £835/£880 per annum (N.J.B. G/9).

Applicants should have technical training and experience in overhead and underground distribution work.

Appointment subject to medical examination. Pension scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, must be forwarded not later than 20th October, 1958. 5030

## CENTRAL ELECTRICITY GENERATING BOARD

FUEL TECHNOLOGY AND COMBUSTION SCIENTISTS required in RESEARCH AND DEVELOPMENT DEPARTMENT at Headquarters in London.

Candidates for the senior appointment should possess a good University Degree in Physics or Chemistry, with research experience in fuel technology and combustion processes relating to the burning of coal. It will be an advantage to have a similar knowledge regarding the burning of residual oils. The successful candidate will be expected to propose, arrange and guide ful-scale researches connected with fuels and combustion. Power station experience would be an asset but is not essential.

The salary will be on a scale within the range £1,540-£2,005 p.a. according to duties and responsibilities of the post.

Candidates for appointments as Assistant Fuel Technology and Combustion Scientists should be qualified chemists or physicists with a University Degree or Corporate Membership of the Royal Institute of Chemistry and/or Corporate Membership of the Institute of Fuel. The two successful candidates will assist in planning, inspecting and reporting full-scale researches associated with problems of fuel technology, particularly those associated with the combustion of coal or oil in power station boilers. The duties will not include laboratory work. Power station experience would be an asset but is not essential.

Salaries will be on a scale within the range £590-£1,315 p.a. according to duties and responsibilities of the posts.

Applications stating age, qualifications, experience, present position and salary should be forwarded to I. G. Ellis, Personnel Officer, 24/30, Holborn, London, E.C.1, by 24th October. Please mark envelopes "Confidential," Ref. ER/291. 5044

## JOSEPH LUCAS (ELECTRICAL) LIMITED

**Great King Street, Birmingham, 19**

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

## INDUSTRIAL TRANSFORMERS DESIGN ENGINEER

APPLICATIONS are invited by one of the leading companies in the electrical industry for a senior appointment to the position of DESIGN ENGINEER, INDUSTRIAL TRANSFORMERS.

Extensive experience is required in the design, production and testing of industrial transformers up to 1,000 kVA, together with the ability and enthusiasm to lead a technical team responsible for the progressive extension of the company's activities in this field.

It is anticipated that a substantial salary will be paid to the engineer with the necessary ability, and the appointment will be eligible, after a qualifying period, for the company's superannuation and pension schemes. Residence is expected in due course in the central Midlands area.

Applicants are requested to write in confidence, giving details of age, qualifications, present salary and record of experience, to the Managing Director.—Box 5031.

## CENTRAL ELECTRICITY GENERATING BOARD

**South Western Division**

ASSISTANT ENGINEER (Efficiency) required at Portishead "A" Power Station.

Superannuation scheme. Salary N.J.B. Class J, Grade 7, £1,065-£1,140 per annum.

Candidates should have had a good technical education, be experienced in the operation of a modern power station equipped with chain grate stokers; be familiar with heat flow, boiler and turbine testing and compilation of statistical data. Knowledge of the chemistry of combustion is desirable.

STATION SHIFT CONTROL ENGINEER required at Plymouth "A" Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 10, £740-£785 plus 10% shift allowance.

Candidates should possess good technical qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

GENERAL ASSISTANT ENGINEER (Maintenance and Technical Records) required at Plymouth "A" Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 12, £635-£680 per annum.

Duties will be of a general engineering nature. A knowledge of the calculation of power station technical statistics would be an advantage.

Applications on form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 18th October, 1958. 5063

## UNIVERSITY OF CAPE TOWN

**South Africa**

LECTURESHIP IN ELECTRICAL ENGINEERING

APPLICATIONS are invited for a Lectureship in the Department of Electrical Engineering. The Lecturer's main qualifications may be either in the power field with experience in electrical machines or in the electronics or communications field.

The salary scale is £850 × £50 to £1,200 per annum. There is also a temporary cost-of-living allowance (at present £234 per annum for a married man).

Applications should state age, experience, qualifications and research work completed or in progress, and should give the names of two referees whom the University may consult.

Two copies of the application and testimonials should reach the Secretary, Association of Universities of the British Commonwealth, 36, Gordon Square, London, W.C.1 (from whom memoranda giving the general conditions of appointment and details about the department should be obtained) not later than 15th November, 1958. An additional copy must be sent direct by air mail to the Registrar, University of Cape Town, Private Bag, Rondebosch, Cape Town, South Africa, by the same date.

The University reserves the right to appoint a person other than one of the applicants or to make no appointment. 5069

## MOTOR CONTROL GEAR DESIGNER/DRAUGHTSMEN AND CONTRACTS DRAUGHTSMEN

APPLICATIONS are invited for the following posts :—

1. DESIGNER/DRAUGHTSMEN for work in connection with electro-magnetic devices used for electric motor control. Applicants must be capable of developing projects into prototype equipments from specifications supplied by Development Engineers.
2. CONTRACTS DRAUGHTSMEN. Experience of motor control gear circuitry is desirable.

Successful applicants will receive assistance towards the cost of removal, should this be necessary.

The company operates a pension scheme and in certain cases a transfer of previous contributions can be effected to the scheme.

Applications giving full details of experience should be sent to the Personnel Manager, Brookhirst Switchgear Limited, Northgate Works, Chester.

**A Member of the Metal Industries Group**

5048

*Situations Vacant (continued)*

**SOUTH EASTERN ELECTRICITY BOARD**

SHOWROOM ASSISTANT (Male or Female), Kingston District. Annual salary £190 to £485 or £565 plus London weighting according to age and qualifications. Superannuable. Knowledge of electrical apparatus and experience in selling and dealing with consumers' enquiries an advantage. Duties include cashiering. Primarily for the Kingston showroom, the person appointed must be prepared to work in any of the Kingston district showrooms.

Applications, quoting reference TER, and naming 2 referees, on forms from District Manager, SEEBOARD, 22, Claremont Road, Surbiton, Surrey, by 22nd October, 1958.

ASSISTANT DISTRICT ENGINEER, Woking District. Salary £790-£835 per annum under N.J.B. Class F, Grade 9. Superannuable. Applicants, of good general education, should have had technical training up to Higher National Certificate standard, with practical experience of general distribution work, and be capable of giving assistance in planning construction or maintenance work.

Applications, quoting reference TER, and naming 2 referees, on forms from District Manager, SEEBOARD, 4, Chobham Road, Woking, by 22nd October, 1958.

GEORGE WRAY,
Secretary. 5067

**CITY AND COUNTY OF KINGSTON UPON HULL**

**City Engineer's Department**

**Street Lighting Assistant**

APPLICATIONS are invited for the appointment of STREET LIGHTING ASSISTANT. Salary within the special grade £750/£1,030.

Preference will be given to candidates who have had electrical training and experience in the design and erection and control of all types of street lighting installations and the control and supervision of maintenance work by direct labour.

Housing accommodation will be provided for the successful married candidate if not already resident within the City.

Applications on forms which can be obtained from the City Engineer, Guildhall, Kingston upon Hull, accompanied by copies of testimonials, are to be returned not later than a fortnight after the appearance of this advertisement.

WM. MORRIS, O.B.E.,
Guildhall, City Engineer.
Kingston upon Hull. 5065

**NORTH WESTERN ELECTRICITY BOARD**

**First Assistant District Commercial Engineer, North District, Salford**

DUTIES will include assisting the District Commercial Engineer in dealing with consumers' requirements and enquiries on all matters, including sale and installation of apparatus, repairs and maintenance, emergency service and tariffs, new supplies and development, control of workshops and service centres, and preparation of specifications and estimates.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £1,160 × £25 to £1,235, Grade G.4. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, by 20th October, 1958. 5029

**JOHNSON & PHILLIPS LTD.**

invite applications for the following posts:—

EXPERIENCED ENGINEERS to supervise cable and overhead line contracts, also factory installations.

JUNIOR ENGINEERS for training as outside Contracts Supervisors.

Candidates must be willing to travel. Applications giving particulars of age, training and experience to—

**Employment Manager**
**JOHNSON & PHILLIPS LTD.**
**Victoria Works, Victoria Way, Charlton**
**London, S.E.7** 5047

**CENTRAL ELECTRICITY GENERATING BOARD**

METHODS ASSISTANT required in RESEARCH AND DEVELOPMENT DEPARTMENT at Headquarters in London to assist in the administration of research projects and being particularly concerned with assessing and improving methods of experiment in a wide range of subjects. Whilst the duties will not include direct control of laboratory or full-scale tests, they will call for a sense of day-to-day practicalities and an ability to find the facts. Frequent visits to power stations and laboratories will be necessary.

Candidates should have one of the following qualifications: A degree or comparable qualification in chemistry with a preference for physical chemistry or, a degree or comparable qualification in physics with a preference for one of its non-nuclear branches.

The salary for the appointment will be on a scale within the range £1,210-£1,795 p.a. according to duties and responsibilities of the post.

Applications stating age, qualifications, experience, present position and salary should be forwarded to I. G. Ellis, Personnel Officer, 24/30, Holborn, London, E.C.1, by 29th October. Please mark envelopes "Confidential." Ref. ER/293. 5062

**NORTH EASTERN ELECTRICITY BOARD**

**Tees Sub-Area**

APPLICATIONS are invited for the appointment of (a) SENIOR DRAUGHTSMAN, (b) ENGINEERING DRAUGHTSMAN, Sub-Area Headquarters, Thornaby-on-Tees.

Successful applicants will be required to carry out site surveys, prepare working drawings for brick substations and similar buildings and minor civil engineering works. Candidates for post (a) should be competent to undertake simple design calculations. Preference will be given to candidates who possess, or are studying for, H.N.C. in Mechanical Engineering (Structural Group) or Building Construction.

Salary (a) Schedule D, Grade 5, £760/£860; (b) Schedule D, Grade 6, £595/£715. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 5045

**SENIOR ELECTRICAL DRAUGHTSMEN**

required for vacancies in London drawing offices of world-wide organisation developing the underground gasification of coal and designing and construction plant for the following:

CHEMICAL ENGINEERING PROCESSES.
NUCLEAR POWER.
MECHANICAL HANDLING PLANT.

Successful applicants would join a team engaged in the design of large electrical installations associated with the above projects. Apply in writing to:—

**H. Liddle**
**HUMPHREYS & GLASGOW LIMITED**
**22, Carlisle Place, London, S.W.1**

5046

**ELECTRICAL ENGINEERING DRAUGHTSMAN FOR STEEL WORKS**

APPLICATIONS are invited for the above position to assist in the first instance in a large-scale electrical reconstruction and extension at present in progress. Permanent position, good salary and pension scheme.

Experience required in electrical plant layout and installation, control and switchgear diagrams.

Apply giving age, qualifications and experience to the Development Electrical Engineer, The Patent Shaft & Axletree Co. Ltd., P.O. Box 9, Wednesbury, Staffs. 4978

**CENTRAL ELECTRICITY GENERATING BOARD**

**South Wales Division**

Ref.: 149/2/RS/EB. Vacancy No.: 100/ER/58

APPLICATIONS invited for superannuable N.J.B. appointment of FOURTH ASSISTANT ENGINEER in the TECHNICAL DEPARTMENT, DIVISIONAL HEADQUARTERS.

Salary AX/DX.8, £710-£910 per annum.

Electrical Engineering Degree or H.N.C. Candidates should have served an engineering apprenticeship and should preferably have had subsequent experience with a large electrical manufacturing firm or in the supply industry. The successful applicant will be employed on interesting problems in generating stations and on the 275 kV and 132 kV grid.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 22nd October, 1958. 5057

**JOSEPH LUCAS (ELECTRICAL) LIMITED**

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

**BRITISH STANDARDS INSTITUTION**

AN ELECTRICAL ENGINEER with a good knowledge and experience of electronics is required by the British Standards Institution for work in an expanding section concerned with the approval of all types of electrical equipment. The work is of a varied and interesting nature, including the investigation of many types of electronic plant, equipment and appliances, and the engineer appointed will also have the primary responsibility for the effective functioning of specialised electronic testing equipment in a laboratory.

Applicants should have preferably served an apprenticeship, should have had a comprehensive experience and training in electronic work, and should have technical qualifications equivalent at least to Graduate Membership of the I.E.E.

The salary will be in accordance with age and qualifications in a grade with a present maximum of £1,200 p.a., and applicants should apply in writing to the Establishment Officer, B.S.I., 2, Park Street, London, W.1. 5070

**LONDON ELECTRICITY BOARD**

**General Assistant Engineer**

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at Fulham, S.W.6.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electricity industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £590 per annum rising to £725 per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 23rd October, 1958. Please quote ref. PER/2517/R. 5016

## EASTERN ELECTRICITY BOARD

**Senior Apprentice Training Instructor**

APPLICATIONS are invited for this superannuable post on Area Headquarters staff but to be located at the Apprentices' Training Centre which the Board will shortly be establishing at Harold Hill, Romford, Essex. Candidates should have had sound practical and technical mechanical engineering training and experience of workshop training. They must be able to plan a course of instruction, lecture and instruct apprentices in all the basic mechanical engineering skills, including benchwork, blacksmithing and welding and the operation of machine tools, and will be required to take charge of assistant instructors. Teaching experience would be an advantage.

Salary N.J.B. Class AX/EX, Grade 6 (£895-£1,140).

Apply by letter, within 10 days, to the Liaison and Personnel Officer, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk. 5056

## MIDDLESEX COUNTY COUNCIL

**Education Committee**

BRUNEL COLLEGE OF TECHNOLOGY
Woodlands Avenue, Acton, London, W.3

REQUIRED: LECTURERS (2 posts) in ELECTRICAL ENGINEERING. Candidates should be graduates with teaching, industrial or research experience. The department is mainly concerned with courses leading to Diploma in Technology. Staff encouraged to maintain contact with industry, carry out research, and read for higher degrees.

Burnham Technical Salary Scales, £1,200 × £30 to £1,350 plus London allowance.

Apply immediately (s.a.e.) to the Principal.

C. E. GURR, M.Sc., Ph.D.,
Clerk to the Governing Body.
5017

## MINISTRY OF SUPPLY

ELECTRICAL, ELECTRO-MECHANICAL and ELECTRONIC ENGINEERS required for research and development, production and inspection branches and Ordnance Factories in London and Provinces.

Qualifications: British of British parents. Recognised engineering apprenticeship or equivalent training. Corporate Membership of Institution of Civil, Mechanical or Electrical Engineers or exempting qualifications. Sound knowledge of theory and practice of electronic or light electro-mechanical engineering.

Salary £805-£1,720 p.a. in London, according to age and experience. Slightly lower in Provinces. Appointments initially unestablished but good prospects of appointment to permanent staff.

Forms from M.L. & N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.369/8A. 5019

## ELECTRICAL DESIGN/DEVELOPMENT ENGINEER

required by leading thermostat and control equipment manufacturers in the Home Counties.

This is a senior appointment and only persons with reasonable experience in the design of control equipment for domestic appliances will be considered.

Appropriate salary for this important position will be by negotiation in addition to which there will be a bonus and a pension scheme.

Applications giving full particulars, age, qualifications, previous experience, present salary, etc., to—Box 5071.

## DRAUGHTSMEN

EXPERIENCED draughtsmen, with apprenticeship, or workshop experience, and O.N.C. or an equivalent qualification, are required at the U.K.A.E.A. Engineering Unit, Bracknell, Berks, for a wide variety of mechanical, electro-mechanical and electronic work.

Salary scale £555 - £865.

Housing and superannuation schemes.

Send POSTCARD to the Group Recruitment Officer (1201/48), A.E.R.E., Harwell, Berks, for application form and details. 5009

## CITY OF NOTTINGHAM

**Assistant Engineers (Structural and Electrical) (£725 - £1,030 per annum)**

APPLICATIONS are invited for the above positions in the City Engineer's Department, Nottingham, within salary range £725-£1,030, i.e., in Grades A.P.T. 2, A.P.T. 3, or Special. Grade and starting salary will depend on qualifications and experience.

Applicants should be experienced in either:—

(a) the design of steel and reinforced concrete structures, particularly building frames; or

(b) the design of electric lighting and power installations for new buildings.

Applications, on forms to be obtained from R. M. Finch, O.B.E., M.I.C.E., Guildhall, Nottingham, are to be returned to him not later than 18th October, 1958. 4949

## DESIGNER-DRAUGHTSMAN

for design and development of electric wiring accessories. Good electrical training desirable and knowledge of mass production methods advantageous.

A high salary with good prospects for a senior designer with previous experience in this specialised branch of the electrical industry.

Applicants should write stating age, education, experience and salary required, and all letters will be treated in strict confidence addressed to: Ref. T.M., M.K. Electric Ltd., Wakefield Street, Edmonton, London, N.18.

4876

## PROJECT ENGINEER (ELECTRICAL)

required for modern factory some 60 miles from London. H.N.C. (Electrical) essential; Membership of Institution of Electrical Engineers an advantage.

Experience in drive mechanisms and their control and coupling required.

Salary range £1,100-£1,200. A new house, to rent, is available.

Apply to Personnel Manager.—Box 5010.

A COMPANY of the Expert Tool Group requires senior draughtsmen; motor control gear and switchgear experience preferred but not essential. The positions are permanent and a better-than-average salary will be paid to the successful applicants. Please write, giving age, present salary, etc., to—Chief Draughtsman, Sharp Control Gear Ltd., Lount Works, Ashby-de-la-Zouch, Leics. 5072

A LARGE British company operating in West Africa requires a man with wide experience of selling and servicing of radio and domestic appliances to act as sales manager. Selling will be on a wholesale basis, but ability to guide and supervise selling and servicing at retail level is essential. A starting salary of about £1,400 per annum is offered with pension fund, family allowance, fully furnished quarters and free passages. There will be ample opportunity for advancement to a man of the right calibre. Details of experience, qualifications and age to —Box 5012.

A LIGHTING engineer to cover North-West England, preferably based on Manchester, is required by an established and nationally known company. The position demands a man able to conceive and present lighting schemes and capable of dealing at senior executive level with particular regard to multiple and departmental stores. A substantial starting salary, together with expenses, pension scheme and a car, is offered. Comprehensive details of experience, etc., in confidence to—Box 5034.

A TRANSFORMER erector is required by the Brush Electrical Engineering Company Limited, Loughborough, for the erection and service of transformers up to 40 MVA, as well as fault finding. Applicants must be fully skilled and used to a fairly wide range of work. They must also be able to drive and hold a clean driving licence. Good pay and conditions of service include non-contributory pension scheme, sickness benefit, canteen, etc. Please apply to the Employment Officer, Brush Electrical Engineering Company Limited, Loughborough, Leics, quoting reference O.5025. 5032

AN experienced technical sales representative to cover the North of England, with knowledge of low-tension control gear. Connections with shipyards and industrial users and Area Boards an advantage. Salary, commission, expenses and car would be provided.—Box 4964.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. Electrical surveyors required for various districts in Great Britain. Permanent positions carrying progressive salary scale £735 to £1,060 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 5035

CABLE makers London area require superintendent for electrical test handling rubber and plastic cable. Write stating age, experience and salary required.—Box 5037.

CHARGEHAND electrician required for high-quality commercial installations. First-class man willing to travel essential.—Electra, 256, Terminus Road, Eastbourne. 5038

CHARGEHAND electricians required. All types of contracting installations. Apply to—John Hearson & Co. Ltd., 4, Portsmouth Street, Kingsway, London, W.C.2. 5073

CHEMIST required by Enfield Cables Ltd., Brimsdown, Middx., for development and investigational work covering a wide field. Applicants should possess Higher National Certificate or equivalent level of education. Salary will be in accordance with age, experience and qualifications. Applications giving brief details, which will be treated in confidence, should be addressed to the Chief Chemist, Enfield Cables Ltd., Brimsdown, Middx. 4993

CIRCUITRY engineers for electric control gear automation schemes covering industrial motor control required by The Donovan Electrical Co. Ltd., Stechford, Birmingham, 33. Permanent positions which command substantial starting salaries with excellent prospects of progressive remuneration. Trainees with suitable engineering experience also required. Write in confidence, giving full details of previous experience, qualifications, age and salary expected, to—Technical Director. 5074

C.M.A. cable works near London manufacturing paper, rubber and thermoplastic cables require a production and quality superintendent. Knowledge of paper cables essential, of rubber and thermoplastic an advantage. Salary £900/£975 per annum in accordance with experience. Contributory pension scheme. —Box 5036.

ELECTRICAL contracting firm in Edinburgh of good standing has vacancies for chargehand electricians for first-class electrical installation work in conduit, pyrotenax and P.V.C. cables. Superannuation and pension scheme. Constant employment and interesting work to suitable applicants.—Box 4967.

ELECTRICAL engineers. Opportunities exist in our power cable research and development dept. for asst. electrical engineers. Work associated chiefly with design, construction and testing of high voltage cables. H.N.C. or equivalent desirable. Pension scheme, canteen and sports facilities. Write with full details to—Siemens Edison Swan Ltd., Ref. 744/32, Woolwich, London, S.E.18. 5075

ELECTRICAL wholesalers (E.W.F. members) require senior and junior representatives to operate from their Luton branch. Also London H.Qts. Senior applicants must have established connection with industrial users and contractors. Accounts are available to be given to suitable applicants. Own staff have been notified. Write brief particulars in strict confidence to—Box 4870.

ESTIMATING/supervising engineer required by London contractors. Must be fully experienced and used to sole responsibility for contracts value £1,000 - £10,000. Salary £750/£1,000, dependent on experience and ability.—Box 5020.

FIRST-class senior electrical engineer required to take charge of the office of a consultant in the Victoria area. Age not below 30. Must have had extensive experience in consulting engineering and be capable of accepting design responsibility for large internal lighting and power installations, mains distribution systems and substations. Salary up to £1,600 according to qualification and experience. Reply in confidence to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 4826

***Situations Vacant** (continued)*

EXPERIENCED representative required quickly by E.W.F. electrical wholesaler to take over existing excellent connections in Berks, Oxon, Bucks, etc. Wonderful opportunity for the right man, car essential, good salary, all expenses and commission. Write in confidence giving details of experience to—A. S. Duran & Co., 30, Kings Road, Reading. 5011

GENERAL office clerk (male), 25/30 yrs. age, used to cable trade preferred. To deal with orders on telephones. Good salary. 5-day week. Telephone or write—Mr. J. D. Dow (WATerloo 6056), Armorduct Cable Co. Ltd., 256, Westminster Bridge Road, London, S.E.1. 5049

JUNIOR draughtsman required for varied work on small and large power transformers, design of control cubicles and special application devices. The position is of considerable scope for person with initiative. Apply giving details of past experience, age and salary required to Personnel Officer, Foster Transformers Limited, London, S.W.19. 4943

JUNIOR technical assistant required for training in transformer design by manufacturing company in S.E. London. Write giving age, experience and salary required to—Box 9505.

LARGE firm of dairy and milk product manufacturers require for executive position an electrical maintenance engineer, mechanical knowledge essential. Must be capable of handling fairly large installations. Write with full details, experience, etc., to—Independent Milk Supplies Ltd., Rossmore Road, Marylebone, London, N.W.1. 5021

LIFT engineer required by consulting engineers for detailed design, preparation of specifications and carrying out tests. Five-day week, spring and summer holidays, luncheon vouchers. Please reply giving details of age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 4827

LIGHTING fittings manufacturer requires experienced representative for Central and South London. Large existing connection given to successful applicant. Salary, commission and expenses exceeding £1,000 p.a.—Box 5076.

LIGHTING sales representatives required for London area. Only salesmen experienced in selling fittings, gear and lamps to industrial and commercial users with proved sales records may apply. Salary and commission. Car provided or contribution made to car owners. Apply to—Secretary, Ensel Electric Co. Ltd., 3, Eden Grove, Holloway Road, London. N.7 (Tel. No. NORth 5866). 4933

MAJOR petroleum distribution company require for their London office a fully experienced electrical engineer for the development of new projects and the maintenance of existing electrical installations. Applicants preferably should have experience in flameproof construction, be familiar with codes of practice relative thereto, and be well versed in the technical supervision of contracted works. Starting salary commensurate with qualifications and experience. Excellent pension scheme. Apply giving full details of age, qualifications and experience to Box 5077. Replies can only be sent to those selected for interview.

NATIONAL building and civil engineering contractors invite applications from qualified electrical engineers (A.M.I.E.E.), age 35/40. Applicants should have sound practical experience in preparing schemes and estimates for temporary works and permanent installations on building and civil engineering works, and in the supervision of work on sites and in workshops. The selected applicant will be eligible for bonus and superannuation schemes after a probationary period. Apply in confidence giving details of qualifications and experience and salary required to—Personnel Manager, Box 5078.

OVERHEAD line engineer required for consulting engineers' office in Scotland. Dual experience steel tower lines up to 132 kV and wood pole construction up to 33 kV desirable. Applicants please send outline of technical training and overhead line experience to—Kennedy & Donkin, 3, North Charlotte Street, Edinburgh, 2. 4982

REPRESENTATIVE wanted by company manufacturing high-class transformers for industrial purposes. Must have a sound knowledge of electronics and previous sales experience. Quick promotion to sales manager if satisfactory. Please write fully and in confidence stating qualifications, experience, age and salary required.—Box 5014.

RADIO service men are required by a leading organisation in Commonwealth West Africa to teach elementary radio theory and practical repair work to African trainees of good education. Experience with domestic receivers and tape recorders would cover present needs, but knowledge of V.H.F. (F.M.) and television would be useful qualifications for the future. Apply giving full details of education, qualifications and experience to—Box 5050.

REQUIRED for trade association, clerical assistant aged 25-35, with engineering background preferably in the electrical manufacturing industry. Ability to work independently necessary. State technical experience and salary required.—Box 5022.

SALES engineer for control signalling and allied types of cable to nationalised industries, consultants and contractors. Salary, expenses and bonus. Write fullest details, qualifications, positions held to—Box 9492.

SENIOR contracts engineer required for expanding organisation in West Country, with experience of battery charging and rectifier applications. Must be capable of handling complete schemes and estimates with customers. Excellent prospects for applicant with required experience and qualifications. Write in confidence to—Box 5080.

SENIOR design development engineer required by well-known manufacturer of rotating electrical machines. A vacancy with opportunity for a man with ability and experience in design of small and medium D.C. machines and controls. Submit experience, salary, age, etc.—Box 392.

SENIOR designer required for work on electric wiring accessories by a company well established in this field, situated in the South London area. Only those with experience in this type of work should apply. The position offers a wide scope for initiative as the successful applicant would be required to see designs through from inspection to the production drawing stage. A substantial salary will be paid to the candidate possessing this specialised experience. Assistance with housing will be considered. Pension and staff bonus schemes after qualifying period. Applicants are invited to write in confidence, giving full details of age, qualifications, experience and present salary. All letters will be answered.—Box 5079.

TECHNICAL assistant required in the publicity department of The English Electric Company, Stafford, to assist in the editing, layout and production of operating and instruction manuals for heavy electrical plant and associated equipment. Previous experience in this class of work desirable. Please apply giving details of age, experience and salary expected to the Assistant Publicity Manager, The English Electric Company Limited, Foregate Street, Stafford. 4971

TECHNICAL representative, experienced in low-tension switch and distribution gear, required by well-known and established manufacturers. To work in the London area, with experience and knowledge of consultants, architects and engineers. Main duties to establish contact and discuss layout and arrangements of electrical installations, and the use of the company's products. Applications in writing stating age, full details of previous employment and experience, together with references, to—Box 5023.

TELEPHONE maintenance engineers required for servicing automatic and manual installations in Cardiff area. Permanent position with pension. Write full details, age, experience.—Reliance Telephone Co., 18, Lawford Street, Bristol, 2. 5051

TRACER required for electrical accessory manufacturers. Must be a neat worker and capable of small intricate drawings. Good timekeeping is essential. Written applications in the first instance to—T. M., M.K. Electric Ltd., Wakefield Street, Edmonton, London, N.18. 5013

TRADE counter assistant required. Write stating experience and salary expected to—Bill Switchgear Ltd., 38, Gillingham Street, London, S.W.1. 9499

WORK study engineer to initiate and control work study in a factory manufacturing all types of electric cables. Applicants should have had at least three years' experience of the application of work study techniques and hold qualifications at least at O.N.C. level. Apply in writing to Chief Engineer and Manager, Liverpool Electric Cable Co. Ltd., Linacre Lane, Bootle, Liverpool, 20. 5052

VACANCIES for senior and junior sales engineers exist at a progressive manufacturer of transformers and kindred equipment in the Greater London area. Permanent employment with good salary and pension rights available to men of good appearance, connections and experience. Please apply—Box 4904.

YOUNG warehouse assistant, 18-21, wanted by electric lamp distributors. Experience essential. 5-day week.—Box 5053.

### APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

## SITUATIONS WANTED

ELECTRICAL contracts engineer, estimating and supervision, also specialist in industrial and domestic floor heating (not manufacturers) desires change.—Harrison, TEM. 6351. 9502

EXPERIENCED representative covering Electricity Board, wholesalers, etc., South-West England, offers services to established manufacturer, sole or agency basis. Resident Bristol.—Box 9488.

GRADUATE Member of the Incorporated Sales Managers' Association at present employed as a snr. representative with a leading manufacturer of electrical accessories is seeking a post as assistant sales manager or similar. Age 35. Good technical knowledge. Many years' successful selling experience in the electrical trade.—Box 9504.

KEEN, conscientious man (41), resident S. London, O.N.C. (Elect.), administration and sales experience with manufacturers, seeks genuine permanent position to prove his ability to earn salary £1,000 per annum.—Box 9503.

MANUFACTURERS' representative, Tyneside area, desires change. Connection with wholesale, retail, industrial, N.C.B. and Area Boards.—Box 9497.

REPRESENTATIVE (31) seeks position with wholesaler. West London area. Sound knowledge of trade, with storekeeping and installation experience. Only live organisations need reply.—Box 9485.

SALES manager, electrical and mechanical engineering, first-class record, contacts all leading wholesalers, seeks change.—Box 9498.

## ARTICLES FOR SALE

### ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., 1/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

**ALBERICE METER COMPANY**
**Fairfax Works, Fairfax Rd., London, N.8**
(Tel. MOUntview 7944, 6373) 191

### HOUSE SERVICE METERS

**200**-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

**UNIVERSAL ELECTRICAL CO.**
**221, City Road, London, E.C.1** 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675 kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-588 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220 v. D.C. to 230/1/50 A.C., 300 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL electric plant, 3 kW, 230 volts, new, unused, automatic start and stop, £198.—Gothard, Eaton Socon, Huntingdon. 5081

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues.—The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, motor generator, rotary converter and Ward Leonard sets in a great range of outputs, speeds and control systems.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc. — Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

LINDLEY-Thompson 750-kVA outdoor type oil-immersed, 3/3-phase, 50-cycle transformer. Primary 11,000 volts. Secondary 440 volts. Vector Group Reference 41Dy11.—Whitefield Machinery & Plant Limited, Cobden Street, Salford, 6 (Tel. PEN. 4746). 5054

MOTOR generator set with work motor forming a Ward Leonard type control for variable speed drive. Set with A.C. motor and starter for 400 volts, 3-phase, 50 cycles, coupled to D.C. generator, 0/400 volts, with exciter and controls; work motor 0/120 h.p., 0/700 r.p.m. Further details from—Dynamo & Motor Repairs Ltd., Wembley Park Works, North End Road, Wembley, Middlesex. 4944

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS and control gear, huge stocks all types, ¼ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject. — F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SECONDHAND electrical plant can be as good as new if you buy it from specialists. Write for our stock list.— Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middlesex (Telephone, Wembley 3121); Soho Road, Handsworth, Birmingham (Telephone, Birmingham Northern 0898). 73

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

9 Crofts 10-h.p. geared motor units, coupled 1,460/309 Metro-Vick vertical compound motors, B.S.D., 400/3/50; 10-kVA Tangye diesel gen. set, 400/230, 4-wire. — Rosefield Salvage, Dumfries (Phone 533). 5082

100-h.p. English Electric squirrel cage protected motor, 400/440/3/50/750 r.p.m., 132 amps., together with Ellison oil-immersed starter.—Box 9501.

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

1,060-h.p., 2,750-volt, 3-phase, 50-cycle slipring induction motor complete with bedplate, bearings and transformer (E.E.C., 1,000 kVA, 11 kV to 2,750 volts), suitable for the above motor. The above complete with new unused spare. Apply — South Durham Steel & Iron Co. Ltd., G.P.O. Box 16, Cargo Fleet Iron Works, Middlesbrough. 5039

## EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

## ARTICLES WANTED

COIL winding machine required, suitable for winding solenoids.—W. H. Shoebridge & Sons Ltd., 54/56, Upper Mounts, Northampton. 5055

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

QUICKSILVER & beryllium copper urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London. N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, modern diesel generating plants, 100/375 kVA, to make up a power station of 1,150 kVA at 400 volts, 3-phase, 50 cycles, 4-wire supply.—Box 5025.

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

## WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

METAL spinnings to your requirements. A.I.D. approved. — Martin-Golod Ltd., Maybury Gardens, London, N.W.10 (WILlesden 3888). 377

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications. Write—Dept. 'S,' Philpott's Metal Works Ltd., Chapman Street, Loughborough. 211

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

## AGENCIES

AGENT required with wholesale connection by manufacturers of electrical conduit fittings for Northern Counties of England, including North Riding of Yorkshire. State area covered.—Box 9500.

FREE lance agent requires further lines Herts. and West Essex. Reputable firms only. Some servicing possible.—Box 9496.

OLD-established manufacturers of industrial electrical equipment wish to appoint a representative on a commission basis for the Midlands area. Applicants must have a good general connection in the electrical and engineering trades, and should state which companies they at present represent and the area covered. Advertisers already have a very good name and connection, but this is the first time such an appointment has been considered.—Box 5040.

## BUSINESS OPPORTUNITIES

**£500,000 AVAILABLE**

to purchase an old-established business in any trade.

Present management can remain.

Write in confidence to

**Reginald Terrell**
**BUSINESS BROKERS LIMITED**
**46, St. James's Place, London, S.W.1**
Telephone: HYDe Park 1678

355

MANUFACTURERS of domestic lighting fittings established 26 years require a sales organisation to distribute their manufactures.—Box 5024.

## EDUCATIONAL

**UNIVERSITY OF LONDON**

A COURSE of Five Lectures entitled "Information Theory and its Applications to Fundamental Problems in Physics" will be delivered by Professor L. Brillouin at 5.30 p.m. on 21st, 23rd, 24th, 27th and 29th October at King's College, Strand, London, W.C.2.
ADMISSION FREE, WITHOUT TICKET.
JAMES HENDERSON,
Academic Registrar.

5015

CITY & Guilds (Electrical, etc.) on "No Pass —No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook. Free and post free.—B.I.E.T. (Dept. 12A), 29, Wright's Lane, London, W.8. 100

CLASSIFIED ADVERTISEMENTS ARE PREPAID

## BOOKS, INSTRUCTIONS, ETC.

"RADIO Circuits: Step-by-Step Survey of Superhet Receivers." 3rd Edition. By W. E. Miller, M.A. (Cantab.), M.Brit.I.R.E., Editor of "The Wireless and Electrical Trader." Although this book deals mainly with the superhet receiver it is equally applicable to the straight set. The circuit of the superhet is dealt with section by section up to the complete receiver. 5s. net from all booksellers, or 5s. 9d. by post from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. C10

"TELEVISION Engineering: Volume II: Video-Frequency Amplification. This volume describes the fundamental principles of video-frequency amplifiers and examines the factors which limit their performance at the extremes of the passband. A wide variety of circuits is described and particular attention is paid to the use of feedback. There is a section dealing with the special problems of camera-head amplifiers. 35s. net from all booksellers. By post 36s. 2d. from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1. C6


**TRANSFORMERS** of all types up to 25 kVA for Single or Three Phase operation, Phase Conversion, etc.

INDUCTA

**COILS** for Contactors, E.M. Brakes, Air Valves, etc. and COIL WINDINGS for all purposes.

**MAINS** Output, and Special Purpose Transformers for Radio Equipment, Chokes, etc.

**SOLENOIDS** for A.C. and D.C. Operation A.I.D. APPROVED

W. F. PARSONAGE & Co LTD
INDUCTA WORKS
PARK RD BLOXWICH WALSALL
TELEPHONE: BLOX. 66464

Telephone: Southampton 68844/5

UNITY Floodwarmth Electric Heating

Telegrams: "Unity Southampton"

*A Product and a Service*

THE PIONEERS OF ELECTRICAL SPACE HEATING

**PRICE REDUCTIONS AND NEW PRODUCTIONS FOR 1959 SEASON**

*Local Engineer and Design Service*

UNITY HEATING LTD., CHILWORTH, SOUTHAMPTON

# ELECTRICAL WHO'S WHO 1958-59

**Essential to all in the electrical industry**

When the first edition of ELECTRICAL WHO'S WHO appeared in 1950 it was hailed as a reference book which met a long-standing need.

The fifth edition of this comprehensive personal directory contains some 8,000 biographies of people in all branches of the industry, showing education, training, careers to date, membership of associations and private addresses, with an additional alphabetical listing of firms and organizations in the industry, with their principals.

The 1958-59 ELECTRICAL WHO'S WHO should be on YOUR desk.

**27s 6d net** BY POST 29s 3d

***NOW READY***

**from leading booksellers**

Electrical Review Publications Ltd. Dorset House Stamford Street London S.E.1

LUMITRON 9-PM 9 SEP 1958 LEEDS

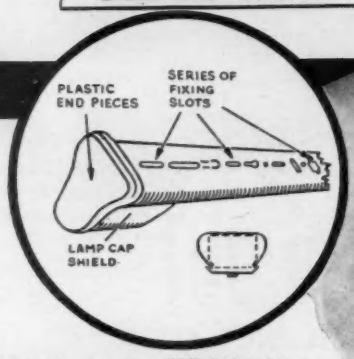
POST OFFICE
INLAND TELEGRAM

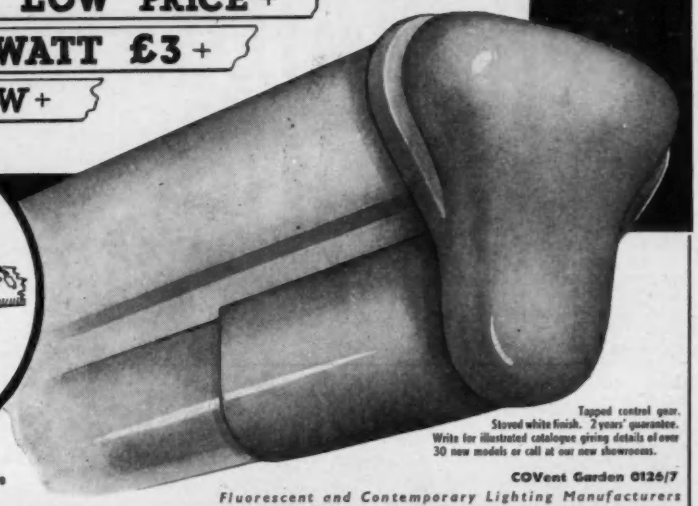
"STAR" LUMITRON BATTEN FITTING +

FABULOUS LOW PRICE +

5'-80 WATT £3 +

ORDER NOW +



Tapped control gear.
Stoved white finish. 2 years' guarantee.
Write for illustrated catalogue giving details of over 30 new models or call at our new showrooms.

LUMITRON LTD. 180 Shaftesbury Avenue London, W.C.2

COVent Garden 0126/7

*Fluorescent and Contemporary Lighting Manufacturers*

*Insist on*

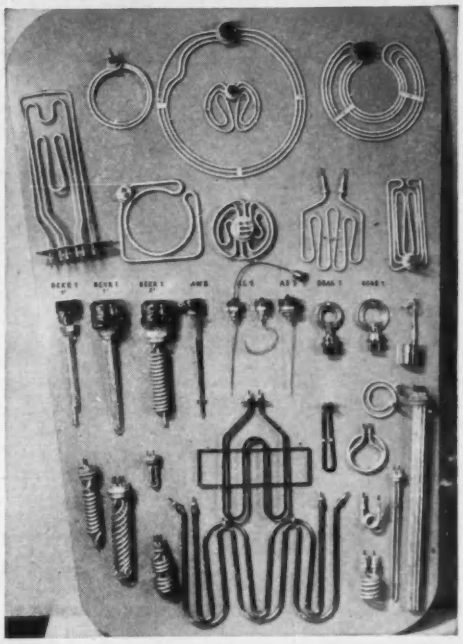
**T.E.C.**

POWER AND DISTRIBUTION TRANSFORMERS TO 100 kVA, LOW VOLTAGE FLASH TEST AND RECTIFIER UNITS, METAL WORK, LIGHT ASSEMBLY, SLOTTED ANGLES AND TRANSFORMER & ELECTRICAL REPAIRS

*Leaflets on request*

LOW VOLTAGE
POWER AND LIGHTING UNITS

**The TRANSFORMER & ELECTRICAL CO. LTD.**
**HONYWOOD RD., BASILDON, ESSEX**
*Telephone: Basildon 20491/3*



**ELTRON for ELEMENTS**

**AIR, OIL or WATER**

**ELTRON (LONDON) LTD., STRATHMORE RD., CROYDON**
THORNTON HEATH 1861

E.R.5

# NAME PLATES
# NAME PLATES
# NAME PLATES

## AND ALL TYPES OF ENGRAVING

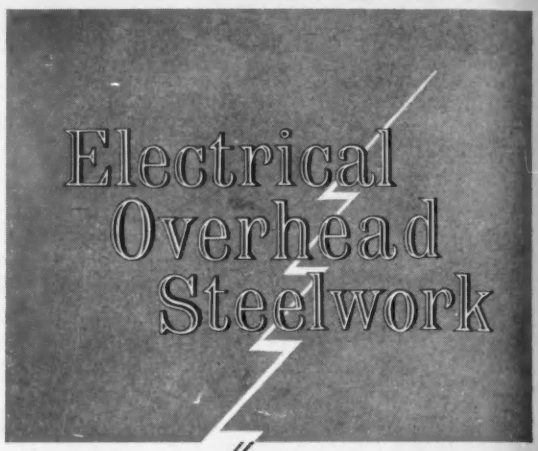
# THEW

**OF GATESHEAD ON TYNE**

SPECIALISTS IN NAMEPLATES FOR THE ENGINEERING AND ELECTRICAL TRADES

EDWARD H. THEW LTD., 1 FIRST AVENUE, TEAM VALLEY TRADING ESTATE, GATESHEAD ON TYNE 11

1778




To British Standard Specifications and Special requirements

Tel. Wolverhampton 24691

**WELLINGS, MALE & CO., LTD.**

FALCON WORKS, CARTWRIGHT ST., WOLVERHAMPTON.

BY APPOINTMENT
TO HER MAJESTY THE QUEEN
MANUFACTURERS OF ELECTRIC LAMPS

# Crompton

## 80w. Warm-White Fluorescent Tubes

## THE BEST IN THE WORLD

**Crompton proudly announce, for their popular 5ft., 80 W. Warm-White fluorescent tubes, the following**

**WORLD-BEATING PERFORMANCE FIGURES**

**INITIAL LUMENS: 5200 MID-LIFE LUMENS: 4720**

The efficiencies of other colours are also increased, as follows.

| Watts | Natural | | Daylight | | White | |
|---|---|---|---|---|---|---|
| | Initial Lumens | Mid-life Lumens | Initial Lumens | Mid-life Lumens | Initial Lumens | Mid-life Lumens |
| 80 | 4400 | 3940 | 4960 | 4480 | 5120 | 4640 |

**Crompton tubes with the new performances are available from stock NOW.** *Further announcements will be made shortly.*

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2

INDEX TO ADVERTISERS


A.E.W. Ltd. ..... 66
Abbot, Brown & Sons Ltd. ..... 96
Adcola Products Ltd. ..... 50
Allen, W. H., Sons & Co. Ltd. .... 84
Allen West & Co. Ltd. ..... 92
Aluminium Wire & Cable Co. Ltd. 1
Atlas Lighting Ltd. ..... 43, 100 & 101

Babcock & Wilcox Ltd. ..... 74
Barlow-Whitney Ltd. ..... 40
Bayliss, Jones & Bayliss Ltd. ..... 26
Beresford, James, & Son Ltd. ..... 104
Berry's Electric Magicoal Ltd. ..... 76
Birch, H. A., & Co. Ltd. ..... 16
Birks, B., & Co. Ltd. ..... 136
Blackwell, T., & Son Ltd. ..... 96
Bolton, Thomas, & Sons Ltd. ..... 113
Bonar, Long & Co. Ltd. ..... 92
Braithwaite & Co. Engineers Ltd... 31
Bridge, David, & Co. Ltd. ..... 110
Britannic Cables Ltd. ..... 42
British Driver-Harris Co. Ltd. ..... 63
British Insulated Callender's Cables Ltd. ..... Cover 1
British Klockner Switchgear Ltd. ... 106
British Resin Products Ltd. ..... 69
British Thomson-Houston Co. Ltd. 5
Brook Motors Ltd. ..... 53
Brookhirst Switchgear Ltd. ..... 33
Brush Electrical Eng. Co. Ltd. ..... 25
Bulgin, A. F., & Co. Ltd. ..... 41

Catmur Machine Tools Ltd. ..... 70
City Electrical Co. ..... 130
City Engineering Co. (Boreham Wood) Ltd. ..... 113
Collins Electrical Ltd. ..... 94
Colne Switchgear (E. & W) Ltd..... 104
Cossor Instruments Ltd. ..... 95
Craig & Derricott Ltd. ..... 114
Cressall Mfg. Co. Ltd. ..... 49
Crompton Parkinson Ltd. ..... 127
Croydon Engineering Co. Ltd. ..... 86
Crypton Equipment Ltd. ..... 28

Daly (Condensers) Ltd. ..... 110
Deco Engineering Co. Ltd. ..... 34
Dorman & Smith Ltd. ..... 39
Dubilier Condenser Co. (1925) Ltd. 79

E. I. du Pont de Nemours & Co. Inc. ..... 58
E.M.S. Electrical Products Ltd. .... 60
East London Mica Works ..... 44
Ekco-Ensign Electric Ltd. ..... 107
Electrical Who's Who ..... 124
Electro Dynamic Construction Co. Ltd. ..... 99
Ellison, Geo., Ltd. ..... 55
Eltron (London) Ltd. ..... 125
English Electric Co. Ltd. ..... Cover 4, 59 & 83
Evans & Newall Ltd. ..... 103
Everett Edgcumbe & Co. Ltd. ..... 36
Express Transformers & Controls Ltd. ..... 52

Ferranti Ltd. ..... 57
Flexello Castors & Wheels Ltd. ..... 21
Fuller Electric Ltd. ..... 13
Furse, W. J., & Co. Ltd. ..... 130

General Electric Co. Ltd. ... 18, 19 & 116
Glenfield & Kennedy Ltd. ..... 82
Great Bridge Foundry Co. Ltd. ..... 66

Henley, Burrowes & Co. Ltd. ..... 128
Henley's, W. T., Telegraph Works Co. Ltd. ..... 64 & 65
Hiatt & Co. Ltd. ..... 128
Higgs Motors Ltd. ..... 29
Hildick & Hildick ..... 16
Hillman Electric Motors Ltd. ..... 38
Hunt, A. H. (Capacitors) Ltd. ..... 90

Ilford Ltd. ..... 51
Imhof, Alfred, Ltd. ..... 6
International Combustion Ltd. ..... 62
Ismay Lamps Ltd. ..... 128

Kaye, E. & E., Ltd. ..... 89
Keyswitch Co. ..... 113

Lancashire Dynamo & Crypto Ltd. 97
Lead Development Association ..... 21
Lewis Spring Co. Ltd. ..... 79
Litholite Insulators & St. Albans Mou'dings Ltd. ..... 24
Londex Ltd. ..... 109
London Electric Firm Ltd. ..... 37
Long & Crawford Ltd. ..... 22
Lumitron Ltd. ..... 125

M.K. Electric Ltd. ..... 10 & 11
Manganese Bronze & Brass Co. Ltd. 87
Meadows, Henry, Ltd. ..... 108
Mek-Elek Engineering Ltd. ..... 114
Mercury Switch Mfg. Co. Ltd. ..... 104
Meritus (Barnet) Ltd. ..... 96
Metropolitan-Vickers Electrical Co. Ltd. ..... 32 & 80
Metway Electrical Industries Ltd. ..... 16, 33 & 38
Micanite & Insulators Co. Ltd. ... Cover 2
Midland Electric Mfg. Co. Ltd. ..... 4
Midland Metallics Ltd. ..... 54
Midland Silicones Ltd. ... 45, 46, 47 & 48
Mills, Wm., Ltd. ..... 111
Mole, M., & Son Ltd. ..... 109
Mudie's Electrical Co. Ltd. ..... 103

Nalder Bros. & Thompson Ltd. ..... 105
Nelco Ltd. ..... 14
Nife Batteries ..... 35

Painton & Co. Ltd. ..... 68
Parmiter Hope & Sugden Ltd. ..... 115
Parsonage, W. F., & Co. Ltd. ..... 124
Parsons, C. A., & Co. Ltd. ..... 102
Partridge, Wilson & Co. Ltd. ..... 3
Perkins, J. M., & Smith Ltd. ..... 88
Pirelli-General Cable Works Ltd. ... 85
Pitman, Sir Isaac, & Sons Ltd. ..... 96
Plant Engineering Co. Ltd. ..... 114
Portable Furnace & Patents Co. ... 33
Prichard, Hugh, & Co. (Nottm.) Ltd. ..... 16
Pritchett & Gold & E.P.S. Co. Ltd. 81
Pyrene Co. Ltd. ..... 27

Ransome & Marles Bearing Co. Ltd. 71
Ratcliffe, F. S. (Rochdale) Ltd. ..... 33
Reyrolle, A., & Co. Ltd. ..... 72
Rist's Wires & Cables Ltd. ..... 20
Rotherham & Sons Ltd. ..... 103
Rowlands Electrical Accessories Ltd. 8

Sangamo Weston Ltd. ..... 76
Saturn Spin Dryer ..... 114
Saxonia Electrical Wire Co. Ltd. ... 38
Scholes, G. H., & Co. Ltd. ..... 17
Scott, A. C., & Co. Ltd. ..... 24
Service Electric Co. Ltd. ..... 130
Siemens Edison Swan Ltd. ..... 54
Simmonds & Stokes (Niphan) Ltd. 21
Sims Electronics Ltd. ..... 49
Smith, Frederick, & Co. ..... 9
Smith & Nephew Ltd. ..... 2
Southern Trade Services Ltd. ..... 24
Spencer Wire Co. Ltd. ..... 91
Square D Ltd. ..... Cover 3
Standard Telephones & Cables Ltd. 112
Sterling Cable Co. Ltd. ..... 15
Sterling Instrument Co. Ltd. ..... 86
Sterling Varnish Co. Ltd. ..... 56
Stevens & Bullivant Ltd. ..... 88
Sturdy Electric Co. Ltd. ..... 27
Sturtevant Eng. Co. Ltd. ..... 7
Sun Electrical Co. Ltd. ..... 73
Sunvic Controls Ltd. ..... 12
Surgical Equipment Supplies Ltd.... 104

T.M.C.-Harwell (Sales) Ltd. ..... 23
Telco Ltd. ..... 96
Texas Instruments Ltd. ..... 30
Thermostatic Controls Co. ..... 27
Thew, Edward H., Ltd. ..... 126
Thompson Bros. (Engineers) Ltd... 49
Transformers & Electrical Co. Ltd... 123
Tullis Russell & Co. Ltd. ..... 61
Turners Asbestos Cement Co. Ltd.... 98

Unity Heating Ltd. ..... 124
Universal Electrical Co. ..... 130

Viscose Development Co. Ltd. ..... 70
Vitos Ltd. ..... 33
Volex Electrical Products Ltd. ..... 129

Washers Ltd. ..... 130
Webber, R. A., Ltd. ..... 16
Wellings, Male & Co. Ltd. ..... 126
Whitehouse Industries Ltd. ..... 67
Willesden Transformer Co. Ltd. ... 60
Wootton & Co. Ltd. ..... 37

Zenith Electric Co. Ltd. ..... 44


Advertisement copy and blocks for printing in black and white should reach us 16 days preceding date of issue addressed to Electrical Review, Dorset House, Stamford Street, London, S.E.1


ISMAY

ART CANDLE LAMP

In 25w. and 40w. White, Opal or Colour Sprayed Champagne, Red or Green. Standard caps B.C. and S.B.C.

*All enquiries —*

**ISMAY LAMPS LTD.**

Roden Street Works, Ilford, Essex

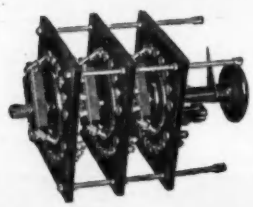
*Telephone: ILFORD 1153*

PLASTIC CABLE CLIPS

The Cable Clip is designed to 'push fit' on to the cable. The carbon steel pin is already part of the unit and will drive into wood, plaster or mortar.

**HIATT & CO. LTD.** Baltimore Road Birmingham 22B

H.B. TRANSFORMER TAPPING SWITCH TYPE L



Interlocked with micro break switch

*Pull Handle to release Lock, then turn*

Also Type O without interlock and Type C for on load switching

SINGLE OR MULTI POLE

*Phone: Kings Norton 1604*

**HENLEY BURROWES & CO. LIMITED**

*Factory Centre:* KINGS NORTON, BIRMINGHAM

# Volex Control Units and Isolating Switches

30 AMP D.P. ISOLATING SWITCH

INSULATED COVER
With or without Pilot Light

30 AMP D.P. ISOLATING SWITCH

METAL CLAD
With or without Pilot Light

It is impossible to detail here the vast range of these extremely adaptable 30 amp. D.P. Isolating Switches and Control Units. We therefore invite you to send for our illustrated leaflet giving full particulars of complete range and prices.

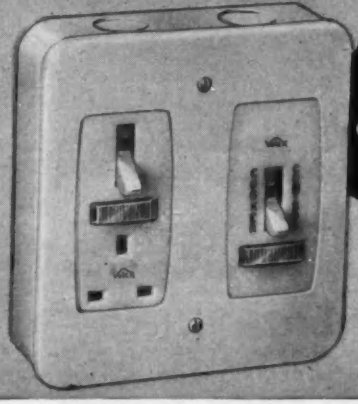
Insulated cover types are available in Cream or Brown finish and metal clad types, either flush or surface mounting in attractive Cream stove enamel finish with optional alternatives of satin chrome plates.

**Available from your usual wholesale suppliers.**

30 AMP CONTROL UNIT

**METAL CLAD**
**With 13 amp. 3 pin Sub-circuit.**
**With or without Pilot Light.**

30 AMP. COOKER CONTROL UNIT



**METAL CLAD**
**With 13 amp. 3 pin Switched Socket Outlet.**
**With or without Pilot Light.**

VOLEX ELECTRICAL PRODUCTS LTD.
SALFORD 6

Telephone : PENDLETON 4373 Telegrams : VOLEXPROD. Salford 6

# "The Secomak REG° Electric Blower never failed"

*A tribute from the Trans-Antarctic Expedition*

Model 7 Blower

Model 7 Blower with Heater Attachment

**"We certainly used the Numax hut and also the Secomak Electric Blower .... The Secomak Electric Blower never failed to operate and we did effect one major vehicle repair job inside the Numax hut using it as a workshop before our main workshop had been built.**
**Thank you for the help and assistance your firm have given the Expedition."**

The Numax hut used in the Trans-Antarctic Expedition is an inflatable one measuring 27 ft. long by 18 ft. wide by 9 ft. high. The standard Secomak blower will inflate such a hut in less than 5 minutes. The blower was wound for 12 volts to operate from a vehicle battery.
Thousands of blowers are used every day for a variety of purposes largely for blowing out dust and other foreign matter from vital parts of machinery, etc.
A simple attachment instantly converts the blower into a powerful suction cleaner.

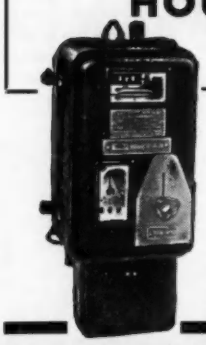
*Arrest that dust & damp with Secomak* **PORTABLE BLOWERS**

*Write for Data Sheet No. 101/ER*
**SERVICE ELECTRIC CO. LTD.** HONEYPOT LANE, STANMORE, MIDDX. *Tel.: EDGware 5566/9*

# WASHERS LTD.

93 IRVING STREET
BIRMINGHAM 15
MIDLAND 1423

# HOUSE SERVICE METERS



Credit Pattern
and Prepayment Type
200-240 v. A.C. S/Ph 50 c. (& D.C.)
*AVAILABLE FROM STOCK*
POLYPHASE 400-440 v. 3-Wire Type
Ex Stock
**UNIVERSAL ELECTRICAL CO.**
**217-221 City Road, London, E.C.1**

# FURSE

**LIGHTNING CONDUCTORS**
**and Earthing Equipment**

Largest Manufacturers and Exporters in Great Britain

*Advisory and technical information service free — complete schemes and estimates. Illustrated literature on request.*

**W. J. FURSE & CO. LIMITED**
33 Traffic Street (Tel. 83471-5 lines) NOTTINGHAM
Also LONDON, MANCHESTER, BIRMINGHAM, BRISTOL

# FREQUENCY CHANGER

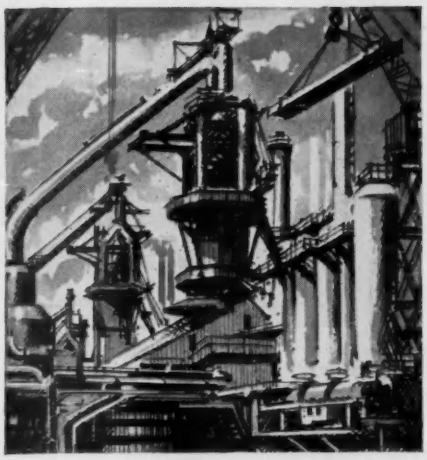
50/400 cycles

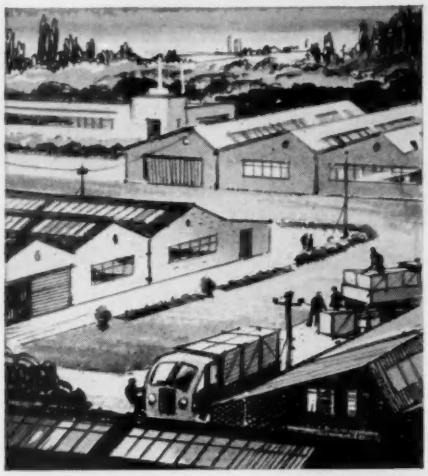
CITY ELECTRICAL BNDN

STOCK DELIVERY

**EMERALD STREET, LONDON, W.C.1. HOLBORN 9722**

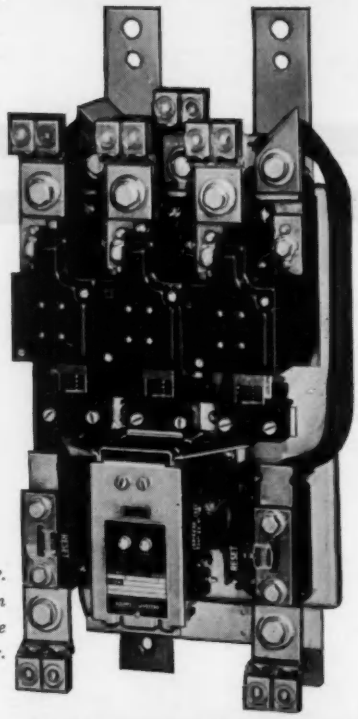

Published by ELECTRICAL REVIEW PUBLICATIONS LTD., at Dorset House, Stamford Street, London, S.E.1
and printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants.





# For every motor there is a Square D starter

## THE PIONEERS IN VERTICAL ACTION DESIGN



*200 H.P. Vertical Action Direct-on-line Starter.*

From general engineering up to the heaviest industry every starting need can be met by Square D. Industrial experience on the widest scale has made this range possible. Exceptional design and production skill has realised the highest standards of electro-mechanical reliability.

Wherever magnetic starters are required—regardless of the motor—they can be readily found from Square D.

In the direct on-line-range there are starters for non-reversing, reversing, and all multi-speed requirements. In the reduced voltage range there are Star-delta, Primary resistor, Auto-transformer, and Stator-rotor starters.

*For information on the complete range, write for Bulletin* 8536.

**Only Square D vertical action starters give you these six advantages . . .**

1. **Quick Installation.**
2. **Top performance.**
3. **Real overload protection.**
4. **Easy inspection and maintenance.**
5. **Wide range adaptability.**
6. **World-wide market acceptance.**

To have the best *Specify* Square D

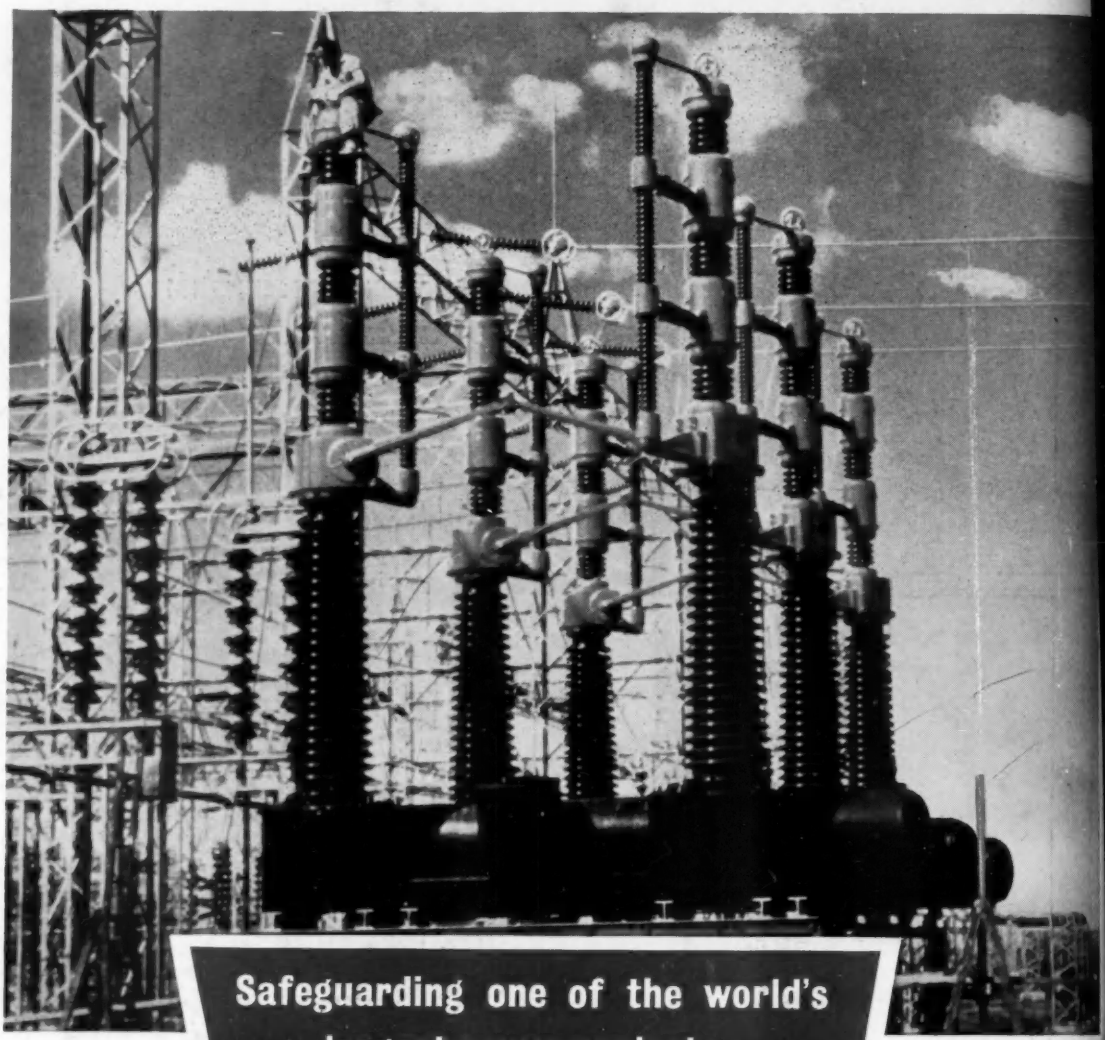
**Square D products are stocked by leading electrical wholesalers throughout Gt. Britain**

FIELD OFFICES — LONDON · BIRMINGHAM · MANCHESTER · GLASGOW

**SQUARE D LIMITED**

**100 ALDERSGATE STREET, LONDON E.C.1 Tel: METropolitan 8646**

SD29



## Safeguarding one of the world's largest power projects

The 'ENGLISH ELECTRIC' 330 kV 10,000 MVA air-blast circuit-breaker at Hydro Quebec's Bout de L'Ile Terminal Station, which stands at the Montreal end of a 400 miles long 300 kV transmission line from Bersimis Generating Station, one of the world's largest hydro-electric projects. From the terminal station, power is transformed down to 120 kV for distribution throughout the Montreal area. Circuit-breakers of this type are designed for system voltages ranging from 220 kV to 345 kV.

*Send for publication SG/250*

# 'ENGLISH ELECTRIC'

## switchgear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2.

*Switchgear Department, Stafford*

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

SGS 27A